INPUT

STRATEGIC MARKET PERSPECTIVE

Worldwide Client/Server Software Market, 1995-2000

Client/Server Software Program

MARCH 1996

Worldwide Client/Server Software Market, 1995-2000

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Abstract

This report analyzes market and technology trends for client/server (C/S) software. It provides worldwide and U.S. C/S software market forecasts from 1995 to 2000 as part of INPUT's Client/Server Software Program. The forecasts are broken down by platform.

Worldwide Client/Server Market Analysis, 1995-2000 provides market forecasts to help decision makers understand the impact of technologies. It also discusses trends, issues and future technology directions.

The report contains 93 pages and 34 exhibits.

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C/S Software Program

Worldwide Client/Server Software Market, 1995-2000

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Introduction

This chapter describes the purpose and scope of this report and lists related reports published by INPUT.

A. Purpose of the Report

The report analyzes client/server (C/S) software trends and related issues. It focuses on how changes in C/S software affect businesses and vendors. Emphasizing systems software, the report answers the questions:

- How will C/S software evolve over the next five years?
- What are the main technical trends and developments?
- How fast are the C/S systems and applications software markets growing in the U.S. and worldwide?
- What are the opportunities and risks for both users and vendors presented by C/S computing?

This report provides insights into the C/S market for:

- Corporate strategists
- Purchasers of C/S systems
- Vendors of C/S software and systems
- Investors in C/S technology

The forecasts and charts are intended for readers to develop market strategies, business plans and financial projections. They are also useful for presentations and sales support.

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B. Scope of the Report

This report covers C/S technology and market trends. INPUT defines a C/S system as one that requires both client and server software to support an application. Also, both the client portion and the server portion of the software are required to make the application work. This includes Internet applications where the Web browser software forms all or part of the client environment. Note that this is a broader definition than may be found in other sources. Lotus Notes, for example, is C/S software. Applications software that runs on dumb terminals and servers is an example of a non-C/S environment.

The report forecasts the C/S software market for both applications and systems software. The C/S software market is defined as:

- Software that is sold for use in a C/S system
- Software that is used to build C/S systems

C/S system budgets and their growth rates are analyzed. Not included in this report are hardware forecasts nor detailed vendor and product information. Also the report does not include forecasts for professional services or systems integration. It does not include forecasts for non-C/S software.

C. Methodology

1. Primary Research

INPUT telephone surveyed 110 user organizations. They were asked to comment on C/S systems implementation plans. The user survey, together with vendor interviews and INPUT forecasts, provides the basis for trend analysis.

2. Secondary Research

Trade publications and on-line information networks provided additional information for this report. Industry trade shows and vendor literature provided additional insights.

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3. User Survey Demographics

Exhibit I-1 shows the breakdown of survey respondents by industry. One hundred and ten (110) respondents identified almost 400 applications being maintained, upgraded or developed in 1996.

Exhibit I-1

Survey Respondents by Industry

Industry Group	Respondents in Group	Industry	Respondents in Industry
Financial and Business Services	23	Banking and Finance	9
		Business Services	6
		Insurance	8
Government, Education, Health and Nonprofit	21	Education	8
		Government - Federal	2
		Government - State and Local	6
		Nonprofit Organizations	2
		Health Services	3
Manufacturing	42	Manufacturing - Process	15
		Manufacturing - Discrete (not Printing and Publishing)	20
		Manufacturing - Printing and Publishing	7
Distribution and Trade	14	Retail	10
		Transportation	3
		Wholesale	1
Telecommunications and Utilities	10	Telecommunications	2
		Utilities	8
Total	**110**		**110**

110 Respondents

Source: INPUT C/S User Survey 1995

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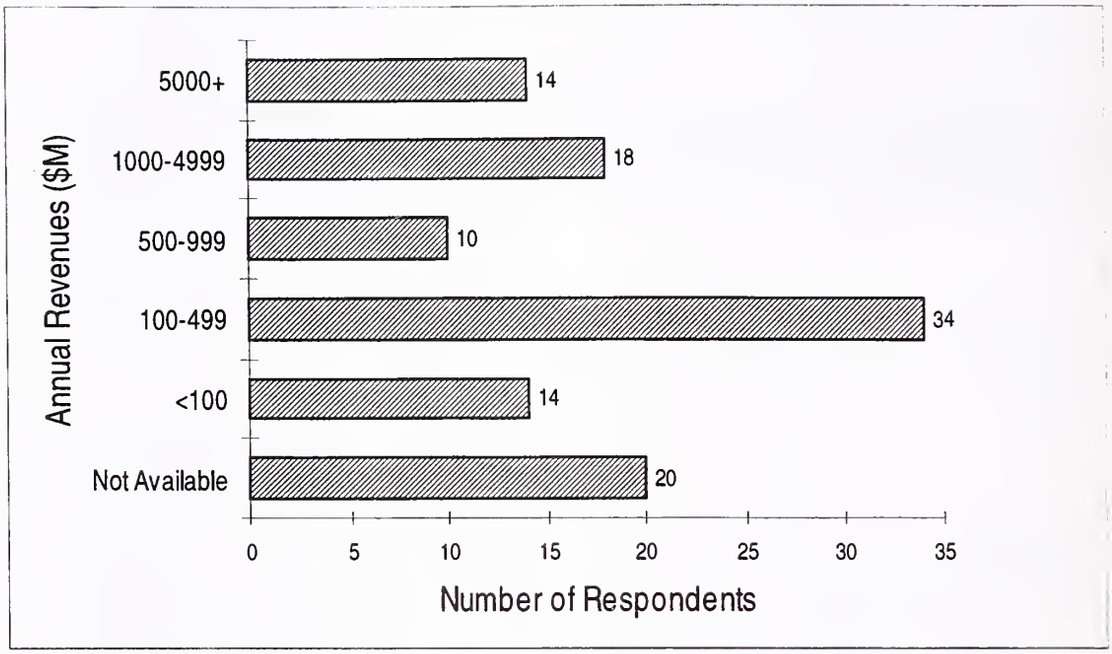
Exhibit I-2 shows the distribution of respondents' company size by annual revenues.

Exhibit I-2

Survey Respondents by Annual Revenues

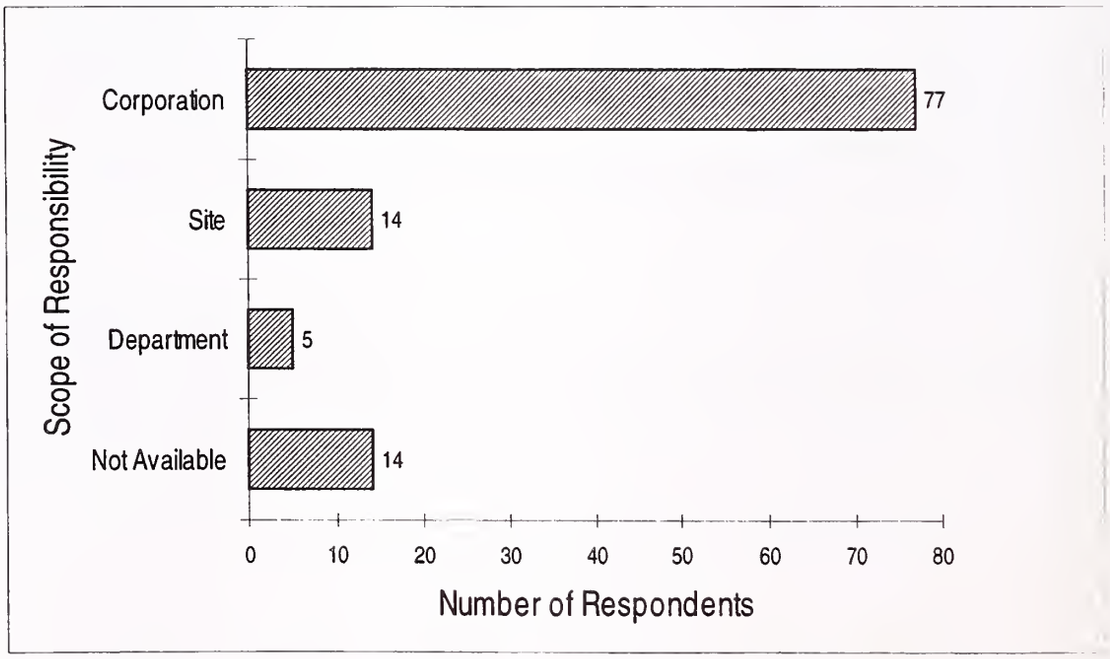


110 Respondents *Source: INPUT C/S User Survey 1995*

Exhibit I-3 shows the scope of their responsibilities.

Exhibit I-3

Respondents' Responsibilities



110 Respondents *Source: INPUT C/S User Survey 1995*

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Respondents were mainly from IS departments, representing their corporation, site or department. Some organizations, such as those in government and education, were unable to provide revenue information. Respondents were selected to cover a range of industries. The sample is biased slightly away from the high-tech industry, where it proved difficult to identify respondents who could answer a phone survey. Hence, the survey reflects traditional industries, with a strong emphasis on manufacturing.

4. Forecasting Methodology

INPUT creates annual forecasts in its Market Analysis Program based on vendor revenues, government data and user surveys. These forecasts are validated with industry data and analysts' judgments. This report's forecasts are based both on INPUT's Market Analysis Program forecasts and an analysis of C/S vendor revenues. They are integrated with information from the user survey on budget growth rates to estimate the size of the market. The forecasts also draw on more detailed forecasts found in other reports in INPUT's C/S program. INPUT also reviewed secondary literature to estimate the value of software sold on different platforms in different categories for the systems software forecasts.

Forecasts are adjusted into current dollars. For example, 1999 forecasts are in 1999 dollars adjusted for inflation. Market forecasts provided by vendors are adjusted per distribution channel to estimate the size of the market in user dollars.

For charts used in the body of the report, where appropriate numbers have been rounded:

- Markets of $1 billion and over are rounded to the nearest $50 million when expressed in $ million.
- Markets between $100 million and $1 billion are rounded to the nearest $10 million.
- Markets under $100 million are rounded to the nearest $5 million.

In some cases rounding errors mean numbers do not add up exactly.

D. Report Structure

The report is structured as follows:

- Chapter II provides an executive overview.
- Chapter III analyzes technology trends.

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- Chapter IV discusses key issues and concerns.
- Chapter V provides market forecasts.
- Chapter VI analyzes opportunities and risks.
- Appendix A provides definitions.
- Appendix B lists vendors mentioned in the report.
- Appendix C gives forecast details.
- Appendix D contains the survey questionnaire.

E. Related Reports

INPUT's C/S Software Program provides a comprehensive analysis of vendors and technology directions. The following reports in the C/S program provide additional information:

- *Component Software: ORBs, OLE and OpenDoc*
- *Internet Security: The Impact of Firewalls on Client/Server Applications*
- *Client/Server Systems Management Software*
- *Middleware: Is DCE the Answer?*
- *Object-oriented Platforms for C/S Systems*
- *The Client/Server Explosion—How Users Choose Platforms*
- *Client/Server Market Analysis, 1993-1998*
- *Client/Server Service Opportunities—Europe, 1993-1998*
- *Client/Server Impact On Major Project Contracting—Europe, 1993-1998*
- *Client/Server Trends in the Federal IT Market: 1994*

INPUT's Market Analysis Program provides comprehensive forecasts in software and services. It also provides analysis of vertical markets. Reports from the Market Analysis Program include:

- *U.S. Systems Software Market, 1995-2000*
- *U.S. Applications Solutions Market, 1995-2000*
- *Worldwide Market Forecast Compendium, 1994-1999*
- *U.S. Market Forecast Compendium, 1995-2000*

INPUT also publishes market analysis reports that cover services as part of its Systems Integration and Outsourcing Programs. They include:

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- *Systems Integration and Professional Services Markets, 1994-1999*
- *The Relationship Between BPR and Systems Integration*
- *Strategies for Successful Alliances*

In addition, INPUT reviews vendor strategies in its Vendor Analysis Program and in its C/S Vendor Profiles. Also, the European and U.S. federal government markets for information services are covered in a series of reports and research bulletins.

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II

Executive Overview

This chapter summarizes the main findings of the report. It examines trends in the C/S marketplace, makes forecasts about future developments and provides an analysis of opportunities for C/S vendors and users.

A. Technology Trends

The client/server (C/S) market continues to expand, a major force being the growth of inter- and intra-company computing. The widespread acceptance of Internet browsers and Web servers will dramatically change the architecture of many C/S computing systems as corporations deploy internal intranets. Another trend is that companies are focusing more on retrieving and disseminating information, rather than collecting it. This is fueling growth in the data warehousing and data mining markets.

1. Enterprise Connection Trends

As the pace of business quickens and becomes global, companies find that well-designed C/S systems can provide a competitive advantage. Several important trends are emerging:

- Inter-enterprise computing—Companies are connecting systems between corporations, going beyond E-mail and EDI applications.
- Extending the enterprise—Companies allow customers and suppliers greater access to internal company information.
- Intranets—Companies are using Internet technology to connect applications between corporate departments.
- Empowering knowledge workers—Workflow, customer service and order desks provide users with more information.

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- Support for remote users—Branch offices, mobile sales forces and telecommuters need seamless connections to the main office.

2. Impact of the Internet

The Internet will have a profound effect upon the software tools and environments used to provide C/S systems. It will bring radical changes in:

- Traditional software structure and architectures
- Database gateways and interfaces
- The types of middleware required—More middleware is needed to support TCP/IP networks and less to mask different low-level protocols—resulting in an overall growth in the middleware market.
- Software distribution
- C/S systems management and support

3. Database Management and Reporting Trends

Changes in business, platform advancements and operating system improvements, coupled with the evolution of the client/server model, are leading to a number of important C/S trends:

- Intelligent data warehouse management
- Increasing use of middleware to connect applications
- Systems integration and custom programming features incorporated into software products
- Cross-platform development tools

4. Industry Battles

The rapidly changing technology, business and software trends are creating a number of industry battles, including:

- Distributed component architectures
- Windows NT versus UNIX
- Network services leadership
- Two-tier versus three-tier C/S architectures
- On-line services versus the Internet

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- Skinny clients versus fat clients

B. User and Vendor Issues

Three types of users invest in C/S systems: market driven communicators, financially driven cost savers and system driven innovators. Each requires a different sales approach by vendors and each has distinct requirements, as discussed later in this report.

1. Changing C/S Issues for Users

Since INPUT's last C/S market analysis report two years ago, a number of important changes have occurred.

- The Internet is providing alternative technologies for implementing corporate applications.
- The pace of business has accelerated—Some companies want to reprogram their systems daily, for example in financial services—ordering takes minutes instead of weeks for soft goods delivered over on-line networks.
- Networking is becoming more complex.
- Users are more sophisticated.
- Security issues are being addressed by firewalls, token cards and encryption.
- Communication is improving between users and IS.

Overseas expansion in the Pacific Rim, Eastern Europe and Latin America means that a greater proportion of new development will be done overseas. Whereas in many countries in these regions software used to be virtually free, copyright laws are increasingly enforced, resulting in greater user spending on software in these areas.

2. Vendor Concerns

Vendors remain under constant pressure from customer demands and the rapid pace of technological development. Astute vendors will consider several factors as C/S develops in the coming years:

- The choice of software development and trading partners
- How they can capitalize on improvements in network performance

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- How they can make their products perform better than their competitors' over a network
- How to support and increase sales in downsized accounts by selling software that improves real productivity
- The impact of free software

C. Market Size

The worldwide market for C/S software is expected to grow at a CAGR of 22%, from $79 billion in 1995 to $210 billion in 2000, as shown in Exhibit II-1. This is a more bullish outlook than INPUT's worldwide software market forecast, which projects the entire business software market growing from $96 billion in 1995 to $170 billion by the year 2000 (for further details, see INPUT's *Worldwide Market Forecast Compendium*).

The viewpoint of this report is based on more optimistic growth and market size assumptions regarding:

- Economic expansion in the Pacific Rim, Latin America and Eastern Europe
- New Internet applications, in particular those related to security and systems management
- New spending on software—Some companies are taking part of their direct mail budget and buying Internet software and services for the World Wide Web instead.

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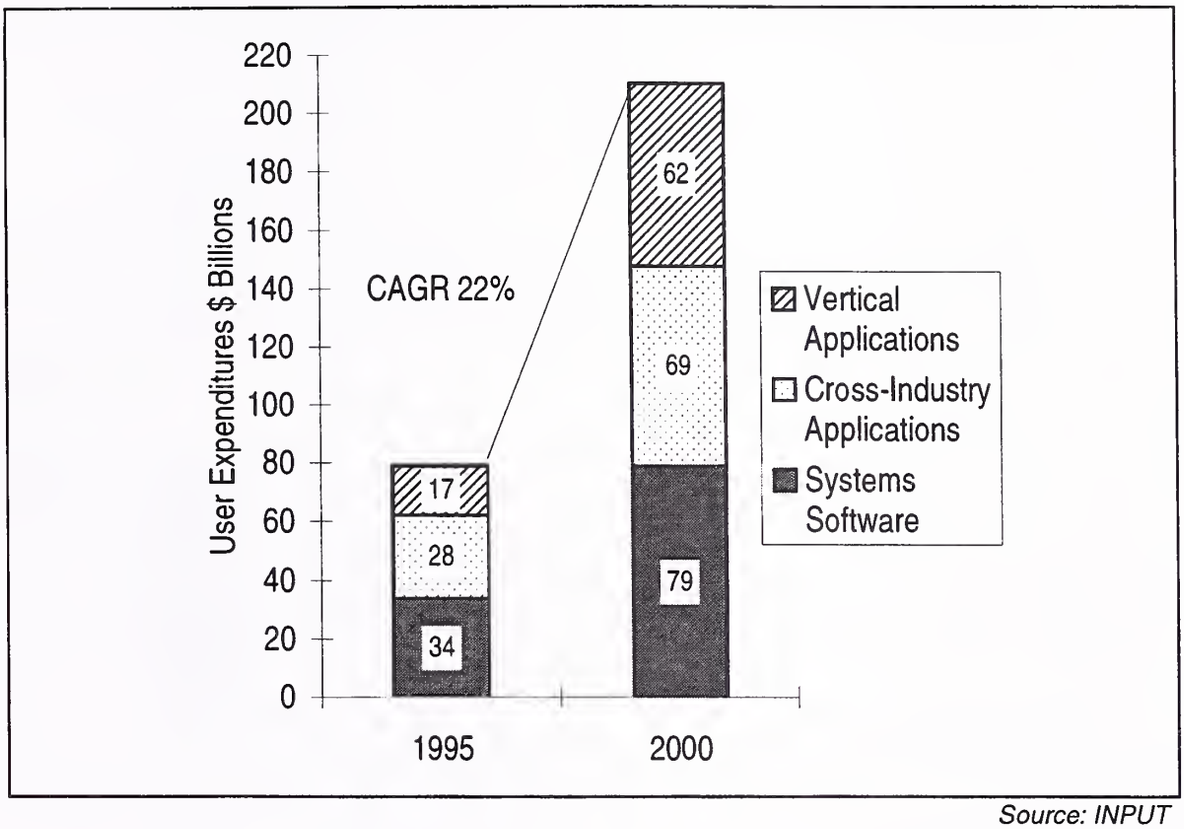
Exhibit II-1

Worldwide C/S Software Market Forecast, 1995-2000



Source: INPUT

The worldwide C/S systems software market was estimated at $34 billion in 1995 (five-year CAGR 18%) and the C/S applications software market at $45 billion (five-year CAGR 19%). The applications market is divided into vertical ($17 billion in 1995, five-year CAGR 30%) and cross-industry software ($28 billion in 1995, five-year CAGR 19%).

This growth is fueled by healthy demand for new Windows NT and Windows 95 operating systems and software. Also, the database market has exceeded INPUT's expectations. The Internet is another factor that is fueling growth in the telecommunications, banking, and publishing markets, to mention a few.

The U.S. market for C/S software is expected to grow at a CAGR of 19%, from $31 billion in 1995 to $73 billion in 2000 as shown in Exhibit II-2. This compares favorably with INPUT's forecast for the entire business software market of $58 billion in 1995 and $101 billion in the year 2000. Basically, the assumption is that most business applications will be client/server by the turn of the century. The U.S. C/S systems software market was estimated at $17 billion in 1995 (five-year CAGR 14%) and the 1995 C/S applications software market at $14 billion (five-year CAGR 14%). The applications market is divided into vertical ($7 billion in 1995, five-year CAGR 27%) and cross-industry software ($7 billion in 1995, five-year CAGR 20%).

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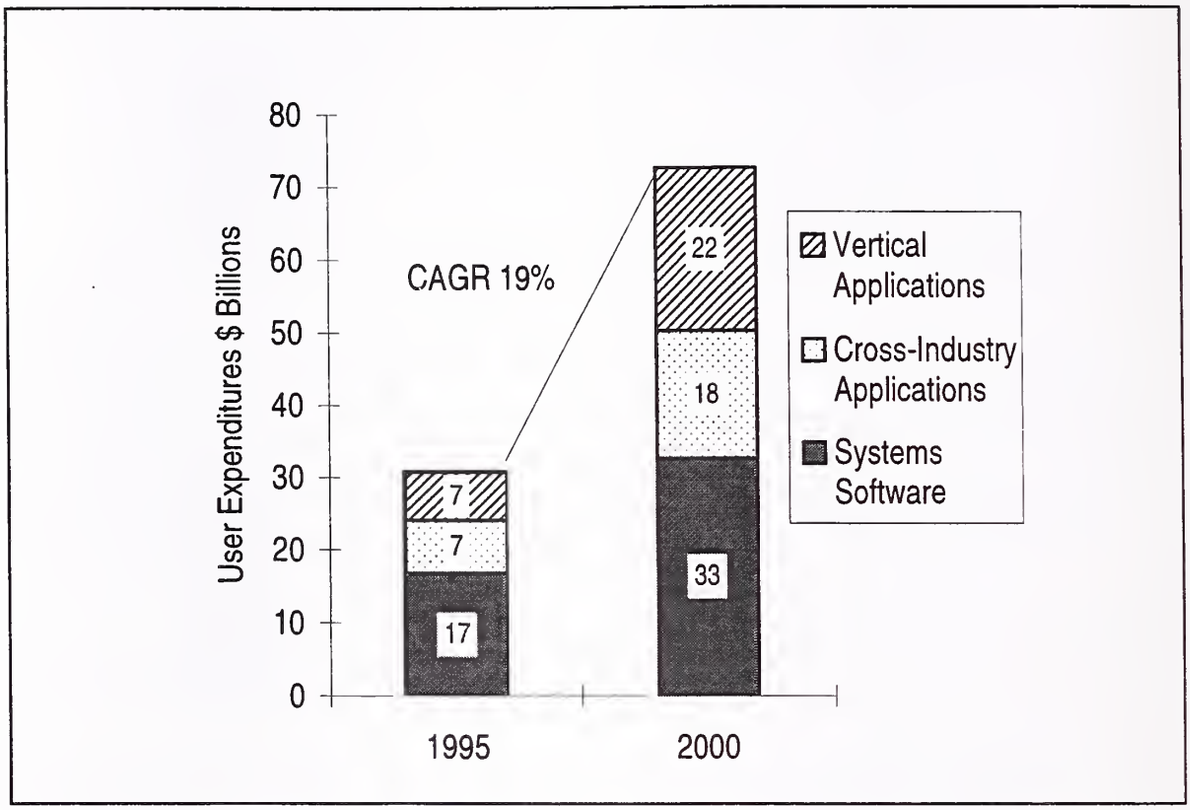
Exhibit II-2

U.S. C/S Software Market Forecast, 1995-2000



Source: INPUT

D. Opportunities and Risks

The changing C/S landscape presents several opportunities and risks for both vendors and users.

1. Opportunities for Vendors

There are opportunities for vendors in the following areas:

- Integration—Users need tools and software to integrate applications, databases, and departments into a seamless, functioning system.
- Smaller companies need vendors to provide more industry-specific solutions to gain competitive advantages.
- Object-oriented tools and repositories—Companies need robust, fast prototyping tools and easier creation of distributed applications.
- Train customers in the management of software and products—providing courses, videos, demonstrations and documentation on how to install, support, upgrade, troubleshoot and customize solutions

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2. Opportunities for Users

The new marketplace presents a number of opportunities for users:

- Use Web browsers and Internet technology
- Connect branch offices
- Seek integrated solutions
- Train users to help themselves solve simple problems, rather than expecting them to rely on technical support staffs
- Shop for packaged software
- Develop a security program

3. Risks for Users and Vendors

The risk for vendors and users in the C/S systems and applications software marketplace include:

- Underestimating C/S budgets—They are growing and companies need accurate analysis of the financial impact of systems.
- Premature cancellation of projects—C/S benefits are not always immediately measurable; companies need sound plans with well-defined phases to ensure that support is continued beyond prototype stages.
- Staff support—Users need to plan for adequate staff support and vendors supporting projects need to understand the staffing requirements.
- Overdependence on vendors—Users can rely too heavily upon database and system vendors. They need to understand where they are locked into products and where they truly have alternatives.
- Networks need to be designed so that they can scale up as required and be readily reconfigured.
- Inadequately trained users—Training may go beyond using a system to customizing it, writing scripts for it and administering it.

4. Recommendations for Vendors

Vendors can build advantages by:

- Investing in integration of specific client/server tools, enabling them to create new products and services
- Applying client/server technology to automate specific business processes, working with market leaders in each segment

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- Extending their product lines—for example:
  - If they are selling to large corporations, they can expand these sales to small businesses.
  - If they are selling to cross-industry markets, they can expand into vertical markets.
- Reevaluating distribution channels—Changes in software pricing, on-line distribution and more intense competition mean that new distribution models are required.
- Including software for systems administration and support with their products
- Providing security products
- Investing in distributed objects and component software
- Investing in the Internet and networking
- Investing time in working with partners—The range of partners for a software vendor has broadened over the last two years to include content publishers, on-line service providers, and entertainment companies.

5. Recommendations for Users

- Consider incorporating users into IS support and administration
- Understand which applications can benefit from Internet technology
- Redefine the role of programmers
- Understand distributed object support
- Manage C/S applications with a business plan

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III

Technology Trends

This chapter describes C/S technology trends. The impact of the Internet on C/S systems, changing platforms, database management, the development environment and industry battles are discussed.

A. Enterprise Connection Trends

1. Evolution of Inter- and Intra-Enterprise Systems

As businesses reengineer their processes, traditional applications migrate from accounting, human resources and payroll to a new model based on processes such as customer systems, supply chain management, electronic mail and document workflow. Suppliers, customers and contractors require connection to corporate systems and external databases from various locations, including remote offices and mobile phones and laptops.

INPUT refers to the evolution of C/S systems in three generations, as shown in Exhibit III-1.

- First-generation C/S architecture is based upon a two-tier system of a single server and single-platform clients deployed for workgroups and departments. Leading development tools for this generation are Powersoft's PowerBuilder, Gupta's SQL Windows and Microsoft's Visual Basic. Many first-generation systems have proven hard to scale up, in terms of numbers of users, addition of more servers or addition of new client platforms.

- The second-generation has multiple servers and multiple clients. Second-generation C/S architecture often uses a three-tier architecture, representing client software, application code and a server where the data resides. Many corporations are implementing second-generation C/S systems today, based on enterprise development tools from companies like Dynasty, Forté and Seer Technologies.

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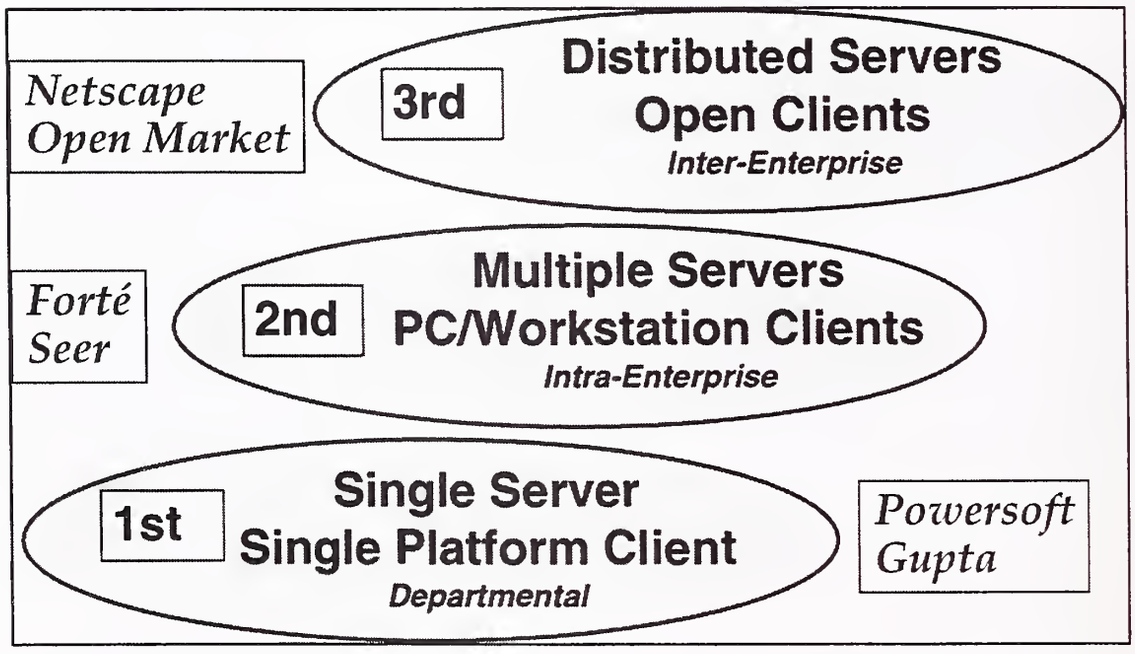
- The third-generation is where leading-edge users are able to accelerate processes the most by linking systems across enterprise boundaries. Traditional C/S technology based on stored procedures and remote procedure calls is not general enough for many inter-enterprise applications, so companies are turning to messaging technology for their system connectivity.

It is impossible in developing and designing third-generation systems to predict the range of clients or servers likely to be supported over the life of a system. Clients need to be separated from servers. Hence, Internet servers and browsers from companies like Netscape and Open Market are increasingly being used as platforms for third-generation applications. The third-generation is where programmers will also use distributed object environments like CORBA (Common Object Request Broker Architecture).

Exhibit III-1

C/S Systems Evolution



Source: INPUT

2. Business Relationships Will Be Based on Software Compatibility

Companies that cannot communicate electronically with their trading partners will be disadvantaged. For example, an accounting firm that uses Lotus Notes to deliver tax information to its clients will require its customers to use the Lotus software if they are to benefit fully from its services.

Strategic business relationships between users and their trading partners will be based around shared data models and process models. Communities of traders will share common software components. This is similar to the EDI (electronic data interchange) environment, in which traders in specific

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industries have their own data formats and processes to exchange such documents as bills of lading and purchase orders.

3. Desktop Videoconferencing and Teleconferencing

Intel and Creative Labs are promoting videoconferencing boards for PCs. The main benefits of these systems are sharing files and collaborative applications, as well as seeing "talking heads." Major applications are in customer support and collaborative engineering projects. Leading software companies are giving videoconferencing boards to their main customers to reduce the costs of product support, speed collaborative development projects, and enhance the customer relationship. Customer presentations are being made over corporate networks, dial-up high-speed phone lines, and the Internet. Whiteboard and videoconferencing applications enable joint developers to share data.

Silicon Graphics bundles a video camera with its desktop Indy workstations. At Hewlett-Packard, a desktop teleconferencing pilot program is currently under way for collaboration between the company's geographically dispersed engineering and technical users. Expect to see HP and others open up the desktop videoconferencing market within the next one to two years, just as they opened up the laser printer market.

B. Impact of the Internet on C/S Computing

1. Winners and Losers on the Internet

Exhibit III-2 anticipates winners and potential losers due to the widespread growth of the Internet. The losers have been labeled as potential losers, as they will only lose if they fail to adapt their business model. This is how some companies are attempting to change their approach to the market:

- Apple - leveraging its strength in desktop publishing into electronic publishing for the World Wide Web
- IBM - interfacing traditional products (e.g., DB2) and services (IBM Global Network) to the Internet
- IBM's Lotus division - reducing the price of Lotus Notes, adding a Web browser to Notes and implementing Java to integrate it better with the Internet (InterNotes already enables Lotus databases to be published on the Internet)
- Microsoft - redefining the Microsoft Network as a node on the Internet that will have quality content and developing an overall Internet strategy that enables MS Office applications to support the Internet

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- Oracle - transforming its database engine into a database for the World Wide Web

The Internet changes data entry. Instead of data being entered centrally, it can be entered by users with Web browsing software. This means that there are opportunities for developers like Spider Technologies to create C/S development toolkits for accessing databases over the Internet.

Exhibit III-2

The Impact of the Internet—Winners and Potential Losers

Product/Service	Winners	Potential Losers
User interface for messaging	• Browsers • Netscape, Spyglass	• LAN E-mail vendors • Lotus
Web servers	• Web servers and add-on features for Web servers • Illustra, Netscape, Open Market	• Document imaging storage and retrieval systems • Wang, Viewstar, Recognition
On-line services	• On-line services with Internet access • GEIS, Sterling, IBM, America Online, CompuServe, Intuit	• Traditional on-line services • EDI, proprietary payment services
Internet access	• Well-funded Internet access services • AT&T, MCI, Sprint, AOL, CompuServe	• Regional Internet access services • Many small companies
Operating systems	• Small OSs • Apple (for Newton OS), Microware, Microsoft (if it succeeds in creating a "lite" version of its Windows OS)	• Traditional OSs, especially if they fail to support Internet features - seamless browser integration, network performance • SCO, Microsoft (if "lite" OS fails)
Network operating systems	• TCP/IP stack vendors • FTP Software, Firefox	• NOS vendors • Novell, Banyan
Collaborative applications	• Groupware for the Internet • Microsoft, Netscape with Collabra	• Traditional groupware • Lotus Notes
Application development tools	• Java-based tools • Sun, Borland, Symantec • Spider Technologies	• Visual development tools that create proprietary clients, C++, COBOL • Powersoft, Gupta
Software distribution	• On-line software vendors • Internet Shopping Network	• Smaller software stores, smaller software resellers

Source: INPUT

2. The Effect on C/S Software

Early Internet applications, like trouble reporting and electronic mail, sent messages. Recent Internet interest is in using it to create, manipulate and view multimedia information.

Virtually every major software developer realizes the impact of the Internet and, not wanting to be a loser, is changing its software by:

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- Adding server interfaces to enable information to be published on the Internet
- Creating development tools for Internet applications
- Providing user interfaces to legacy applications from Internet browsers

INPUT believes that some companies like Microsoft and Oracle will succeed in making the transition, and others will lack the capital, agility or decisiveness to move to Internet-based solutions. Microsoft has already started to promote Internet-enabled Windows systems and applications software. After abandoning Blackbird as its proprietary development environment for the Microsoft Network, it has purchased Vermeer, a Web development tool vendor.

The Internet extends corporate boundaries. Suppliers, customers, investors and subcontractors can gain access to select regions of corporate information systems using Internet interfaces to traditional systems. Security systems, including firewalls and encryption, are a fast-growing market segment. The Internet requires new application development and systems management tools. Tools will reach beyond corporate boundaries so that users can manage interfaces to their service providers.

3. Internet Applications

Expect to see several announcements a day for Internet and WWW capabilities being built into applications. They will come from all directions:

- Systems management
- Application development tool integration
- Web browsers integrated with accessories such as electronic wallets
- Links between Web servers and database applications
- Web browsers as user interfaces for corporate applications
- Product extensions for compatibility with Netscape's browsers and servers and Sun's Java language

Advanced development packages for the WWW will come close to eliminating the need for most programmers to master lower level programming languages, such as C++ and Smalltalk, as a number of new development tools are announced.

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4. Web Site User Profiling Will Be Extended to C/S Systems

Analyzing Web site usage provides marketing departments with an entirely new form of information. Software is available to track who browses a site and what pages they look at. By analyzing user profiles, either from an electronic mail address or from a special code that can be downloaded over the Internet, Ipro (San Francisco) offers both codes and an analysis service to help companies understand their customers. For example, consider an Internet music store. If a user visits the store and shows an interest in CDs, the software will make available more CD titles for him to browse. It may also update the ordering and inventory system should he decide to purchase titles. User profiling can be used by IS staff to understand how information is handled in a corporation. Client/server systems are going to incorporate more Web technology, not just for ease of implementation, but also to understand how the software is used.

5. Internet Appliances

A number of designs for a low-cost "Internet appliances" have already been announced from Oracle, Sun and others. Essentially, this stripped-down Internet computer will have a ROM-based OS like that designed for a Newton or like Geoworks' GEOS. It will, like the Sony PlayStation and Nintendo game machines, feature a fast, low-cost RISC processor that supports multimedia. Other features of an Internet appliance include a modem or network interface or ATM card, 4 to 8MB of RAM, a plug-in for a screen and a low-cost hard disk or flash memory card. Priced around $500, promising markets appear to be consumers without computers and some business offices, such as bank branches, that need simple computers for Internet-based applications. Internet appliances may be beneficial for some client/server applications such as order entry, sales support and information retrieval.

6. Voice Over the Internet

A promising direction—using the Internet for voice connections—could bring profound benefits to companies that are currently using client/server systems. Currently, using the Internet for voice transmission is somewhat awkward, as transmission is half-duplex, but it can be expected to improve over time.

Voice would be able to be an integral part of an application. The current scenario, where telephone networks are integrated with user PCs or terminals for such applications as customer support, would be augmented by one where the Internet carries both voice and data traffic.

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C. Database Management and Reporting Trends

1. Databases

Since the last version of this report, leading database vendors have made major product announcements to support parallel processing, video and multimedia. Last year's attention on video servers has been partially redirected toward the Internet, where both short-term returns and long-term market penetration are possible. Databases are being linked to the Internet with Web servers that publish reports from the database as HTML documents.

Oracle's thrust is to simplify application development and systems integration. It has made a strong push into the development tools market with its Developer/2000 software, as has Sybase with Powersoft and Informix with its New Era development tools. Oracle 8, the next release, will support objects. Sybase stumbled in 1995 with scalability problems and a slow transition to System 11, which has now shipped.

Informix regained momentum in 1995 with emphasis on parallel computing. It has also strengthened its vertical marketing. Its recent acquisition of Illustra will strengthen its presence in the Internet market. Oracle is increasing its applications solutions business by emphasizing vertical markets, such as oil and gas. Illustra, starting as a technology vendor with an object-relational database for image processing, time series analysis, document management and spatial data processing, has repositioned itself as a multimedia database vendor. It has made software libraries to support the Internet and provides a pragmatic solution for keeping track of Web documents and content. Informix and Illustra expect to create a Universal Server to store multimedia objects by year end 1996.

Support for very large, sparse databases is being provided by some of the data warehousing vendors like Red Brick. Other companies moving into the data warehousing arena include Information Builders and Platinum Technology. Information Builders can leverage the installed base of its FOCUS database and EDA/SQL middleware. Platinum's recent acquisitions in database tools, middleware and business reporting enables it to position itself as a tools vendor for data warehousing, particularly with IBM's DB2. With its Data Joiner product, IBM is also increasing its presence in middleware. IBM can be expected to increase its presence in visualization and reporting tools in 1996.

Object-oriented database management systems (OODBMSs) are being used in applications beyond persistently storing C++ and Smalltalk objects. Network management, data repositories and engineering data storage are some traditional OODBMS applications. Financial trading, scientific data

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processing and oil exploration are emerging areas for object-oriented database technology. In short, they are useful for storing information that is not easy to represent in a table.

2. Intelligent Data Warehouse Management

Data warehousing is fueled by a need to access and interpret information, rather than a need to store and enter data that can be served by traditional relational databases. A warehouse brings data from different sources together for comparison. It may be a virtual warehouse that points to data stored in other databases or it may copy data from other sources. If it points to data, accuracy is easy to maintain, but performance may be slow. Replicating or copying data often makes the warehouse perform better, but it may contain outdated information. Maintaining and managing a data warehouse offers opportunities for tool and service providers.

How does implementing a data warehouse increase business? Companies use data warehouses to:

- See new relationships between data
- Bring together data from disparate systems
- Track sales and inventory accurately
- Provide superior customer service
- Market accurately to new customers

Three-dimensional (3D) and visualization tools allow for easier recognition of the interrelationships between data that support business decisions. For example, using a data warehouse, a supermarket showed that diapers were being purchased after work. The purchasers also bought beer. Placing beer next to the diapers in the store increased sales dramatically.

3. Business Reporting Software

Closely related to data warehousing is the rapid growth in database reporting software from companies like Crystal Reports and Business Objects. Business reporting that can route visually stimulating reports electronically is going to be a major application category in 1996. Organizations will provide graphical reports to senior management, in the same way that presentation graphics have helped executives present arguments. Reporting software will support traditional paper reports, routed reports and retrievable reports. Routed reports will be sent using workflow software or E-mail to users. Retrievable reports will be available to anyone able to access them on a server.

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4. Middleware

Middleware provides robustness in large mission-critical environments. INPUT's report *Middleware: Is DCE the Answer?* provides detailed middleware forecasts. Middleware mediates among hosts, servers and clients, enabling them to support and access information transparently, no matter where it is located.

Middleware lessens the danger for a user of being locked into proprietary database solutions. As middleware becomes more intelligent and automated, it will provide better services to enhance business processes. For example, if a bank receives a service call from a critical customer while a representative is on a routine call, the server can flag the call as priority. This enables the representative to dismiss the current caller and take the critical call. By the time the representative has connected to the critical caller, the software will have updated the customer service screen with customer record and account information.

D. Industry Battles

1. Summary of Industry Battles

Some companies compete for the distribution channel and others compete for the customer. In general, systems software companies fall into the former category. Enterprise applications software companies, led by SAP and Oracle, want to own the customer and to influence the surrounding support services; hence, they make tremendous efforts to train professional services and systems integration firms to promote their products. Packaged software vendors try to control the distribution channel, fiercely competing for shelf space.

A new battle arena has developed in cyberspace. Companies are competing for electronic real estate, positioning their links on popular Web sites. They are competing heavily for advertisers. Competitive companies need systems that can link from the enterprise to support their Internet presence.

The technology areas in which client/server software companies are competing most intensively are shown in Exhibit III-3. It predicts the probability that the leader in the second column will win by the year 2000 and gives comments for cases in which leadership is uncertain.

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Exhibit III-3

Industry Battles

Battle	Likely Leader	Contenders	Probability of Leader Winning by 2000
Distributed component architectures	Microsoft	Apple, IBM Vendors aligned with CI Labs and the Object Management Group	For OLE 0.9 For COM 0.5
Windows NT versus UNIX	Microsoft	UNIX vendors	For mid-range 0.7 For massive apps. 0.3
Network services	Novell	Microsoft, Digital, HP, IBM, Sun, CA; AT&T, MCI, Sprint with services	0.5
Messaging servers	Microsoft	The Internet with many solutions	0.6
On-line services	AOL	The Internet	No winner; both will survive
Skinny clients versus fat clients	Oracle for marketing, Sun for hardware	Microsoft and Apple for the OS; PC and workstation vendors	May all be upset by a consumer products company or Thomson
Two-tier versus three-tier	Oracle and database vendors	SAP and application vendors	Consumer will dictate choice and neither will be pure solutions
Traditional OSs versus emerging OSs	Microsoft	Microware, Apple and others	0.5
Database companies become leading Web server vendors	Oracle	Netscape and others	0.5

Source: INPUT

2. Distributed Component Architectures

As discussed in INPUT's report *Component Software: ORBs, OLE and OpenDoc,* there are two distributed component battles under way, both between Microsoft and the rest of the industry. The OLE battle competes with OpenDoc and other architectures for compound documents, which includes Internet-based approaches using Java and HTML. Microsoft appears to be the market leader in this battle.

The second component software battle is for distributing objects across the network. The outcome of this is less clear, as Microsoft has not yet gained control of the enterprise server. There is no one challenger to Microsoft—IBM, Sun, Digital and HP being in strong positions:

- IBM because of the range of servers already installed
- Sun because of its networking and server penetration
- Digital because of its installed base, connectivity and messaging

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- HP because of its telecommunications networking expertise, quality products and support

It may be a multi-tiered battle in which departmental LANs use Microsoft's COM approach and enterprises tend to favor CORBA. This leaves opportunities for vendors to develop application-specific middleware. Regardless of who wins the component wars, systems integration projects will change. There will be more emphasis on component tracking and integration, rather than on debugging low-level code. The potential number of combinations of components needed to integrate an application becomes exponential, hence the need for data repositories that can keep track of component versions, APIs and application features.

3. Network Support Software

Network support software, sometimes called network services, means software that enhances a network's operation, including software for directory services, routing, single sign-on, security, transaction processing and network management. Novell is leveraging its NetWare installed base, with its directory and network management services to support Windows NT and other platforms. This is a fertile area in which Microsoft will compete fiercely with Novell. The long-term success of Novell depends on it winning this battle. Sun will be a keen competitor; it has strong networking technology, as do HP and Digital. IBM has also declared network-centric computing to be its key software architecture strategy. ICL is becoming a key OEM supplier of software for network support, licensing systems management software to CA and having strong directory products.

Communications companies like Sprint, MCI and AT&T may choose to manage networks as a service, rather than selling software products. In this arena they will also face EDS and other outsourcing vendors with high-performance networks.

4. Messaging Servers

Microsoft's MAPI technology is being deployed in its Exchange Server, which promises to revolutionize messaging in the same way that Lotus Notes did. The Exchange client software is already available for Windows 95 and enables messages, faxes, voice-mail and documents supporting its standards to be sent to a common mailbox on the desktop. Apple's PowerTalk is a similar attempt to integrate E-mail. Whereas the Internet provides its standard POP servers that can be accessed by a wide range of mail clients, users are likely to flock to Microsoft's solution because it is well integrated with Microsoft's other products, including Microsoft Office. Microsoft's real competitor in the messaging server market is a diverse market of Internet solutions. It also competes with other mail vendors like Qualcomm with Eudora, IBM with Lotus Notes & cc:Mail and NCD with Z-Mail.

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5. On-line Services versus The Internet

Will users still need access to on-line services from their client PCs and workstations? The Internet browsers will work seamlessly from operating environments like Windows 95. On-line services will still have subscribers; their challenge will be to integrate seamlessly into corporate applications and environments.

On-line service vendors understand how to organize and manage data collections. They will, as CompuServe has already done, make it easy to collect mail from them by supporting Microsoft Exchange.

6. Skinny Clients versus Fat Clients

A debate is raging over whether users should have simple appliance computers on their desktops or PCs with peripherals that may be costly to support and upgrade. Oracle, in particular, is advocating Internet appliances for browsing the WWW.

INPUT believes there are places for both types of clients. Skinny clients, which have few features, will be preferred by corporations that have simple applications and strong central IS departments to support them. Cost-conscious users will be attracted to skinny clients. The skinny clients will be particularly attractive to branch offices, where technical support expertise may be limited. However, fat client users will demand more powerful workstations, richer user interfaces and multimedia support. Users who need to analyze and process masses of data will prefer local workstations.

7. Two-Tier versus Three-Tier Client/Server Architectures

In a two-tier C/S architecture, the typical components are client and server. The client sends queries across a network to the server, which in turn sends back results. The application software may reside partially on the server and partially on the client. Two-tier architectures are particularly favored by database companies that can provide a user with an integrated solution.

Three-tier architectures separate the data storage from the application logic, which resides on an intermediate server. This flexible architecture is frequently supported by those advocating a two-tier architecture. A three-tier architecture makes it relatively easy for the user to switch databases or integrate an application across multiple database servers.

In reality, applications are not simply two or three tier. They are built from complex network modules. Object-oriented architectures and the WWW promise to simplify the complex labyrinth of clients and servers found in a typical enterprise application.

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8. Traditional OSs versus Emerging OSs

Can Windows survive the onslaught of simpler OSs for Internet appliances and TV set-top boxes? Will server-centric computing make Windows obsolete? Unlike OS/2 and UNIX, Windows 95 is far from ideal in handling multiple data streams from corporate networks and on-line services simultaneously. This is one reason it may be replaced by Windows NT, ultimately, as a client operating system. For the next five years, Windows is unlikely to be unseated as the dominant client operating system in corporate environments. Users are likely to have multiple client machines, some with Windows on the desktop and incompatible ones that run other OSs. Connectivity between the different environments will be key.

9. Web Servers versus Databases

If every application that uses a database requires at least one Web server, then the Web server market has the potential to be a $3.5 billion market by the year 2000. Netscape may be larger than Oracle in ten years' time. This is because Web servers serve more than just database data: they can serve text files, multimedia, graphics and images. Databases and Web servers co-exist, with Web servers managing access to data from the Internet and databases providing structured data storage.

Different types of data require different types of storage. Hence Illustra, with a multimedia server, and Verity, with a full text server, have integrated Web server interfaces into their products. The trend will be for Web servers to be integrated with database management software, particularly for low-end applications. Just as there is a personal database market with packages like Lotus Approach and Microsoft Access, there will be a personal Web server market as everyone promotes their information on their own Web page.

Ultimately, as Web servers increase their storage capabilities and as database vendors enhance their multimedia and Internet access modules, the competition that has already started between Netscape and Oracle will intensify. This battle will tend to fragment the database market further, as specialized data storage environments emerge. This will provide more opportunities for middleware to link different data storage environments, enhancing the integration with intelligent agents and dynamic programs that automate business processes. Some of the many applications that are particularly suitable for Web browsers include:

- Order entry
- Sales collateral and pricing support
- Electronic catalogs

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- Business reporting
- Technical documentation
- Product registration
- Customer service and support information
- Customer surveys

Traditional C/S architectures will continue to exist, but there will be a major thrust to support distributed object architectures and messaging.

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IV

User and Vendor Issues

This chapter describes issues raised by users and vendors concerning client/server systems.

A. Types of Users

The users surveyed for this report can be classified into three groups, based on the survey data:

- Market-driven communicators
- Financially-driven cost savers
- System-driven computer innovators who want client/server systems for developing a competitive business advantage

Exhibit IV-1 shows three categories of companies, their business motivation and their needs.

Exhibit IV-1

User Characteristics

Type of Company	Motivation	Needs
• Communicators	• Market driven	• Better internal communications • Better communications with customers • Better communications with suppliers
• Cost savers	• Financially driven	• Reduced maintenance costs • Better management support for technology investments
• Innovators	• System driven	• Reduce development costs • Flexible systems

Source: INPUT

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1. Communicators

Communicators are market-driven companies that believe their business performance will be improved by better communications. They include:

- Nonprofit organizations
- Companies that already use electronic commerce, like manufacturers, distributors, transportation companies
- Services companies, banks and insurance companies that need to be close to their customers

They buy systems to improve the quality of communications, make them more rapidly and provide higher levels of service. The competitive advantage of communicators is their ability to articulate a corporate message and persuade customers to purchase their products.

2. Cost Savers

Cost savers react to the changing business climate defensively and attempt to entrench the company in their industry when faced with competition. Many of these companies need to restructure but are reluctant to commit to the cost of doing so. They include:

- Nonprofit organizations
- Government and educational organizations
- Companies that are not market leaders

In the latter category are companies that have downsized but failed to reengineer their businesses to compete effectively. Companies in this category fail to invest sufficiently in client/server systems and fall further behind. Selling to these companies will require an incremental approach that helps a company define a niche in which it can be successful with low investment in systems. In the commercial environment, these companies are often competitively disadvantaged, lacking the will to win.

3. Innovators

Innovators want to use technology in their businesses to build more efficient systems. They include:

- Small, growing companies that need systems that give them a competitive edge

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- Utilities and service organizations that need new approaches to customer support and maintenance
- Manufacturers that use computers to design and manufacture creative products—For example, in discrete manufacturing, automobile companies use 3D models to design cars and in process manufacturing, molecular modeling systems help pharmaceutical companies design new drugs.

A competitive advantage of these companies is their product. They will often be interested in purchasing leading-edge software and hardware, even though it may be unfinished, to provide them with a competitive advantage. Their competitive advantage initially will be technology, but over time they will need to refine and automate their business processes further as technology keeps up.

4. Selling C/S Systems to Different Users

In selling C/S systems, communicators are likely to invest in sales, marketing, decision support and electronic mail systems. This segment is a heavy user of the Internet, publishing marketing materials on the WWW. Cost savers invest in integrated financial systems, management reporting software, logistics systems that reduce the cost of handling goods, and workflow systems that make office workers more productive. Innovative, systems-driven customers tend to be early adopters of technology and invest in leading-edge systems. They are more likely to have some users with SGI or NeXT solutions that give them competitive advantages.

B. Changing C/S Issues for Users

1. Shift in Concerns Over the Last Two Years

Concerns have changed since INPUT's last C/S market report was written two years ago. Overall, C/S is more widely accepted as a solution to business problems. Many companies have established either successful integration with or migration from the mainframe. They have successfully retrained programmers, and feel that they have experience to tackle the next level of C/S.

However, there were some companies continuing to support older text-based applications. Some of the systems that are still being implemented as non-C/S systems using character-based user interfaces include:

- Payroll and accounting modules
- HR applications
- Order entry and telemarketing

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- AS/400-based applications
- Manufacturing applications
- Retail store and pharmacy systems
- Billing systems
- Upgrades to legacy transportation systems
- Transaction processing systems using CICS and terminals

By far the leading investment in non-C/S applications was to upgrade or add new modules to installed accounting systems, particularly those running on minicomputers and mainframes. Other systems that were not implemented using C/S technology, but did run on a PC under a windowing system, include:

- Standalone desktop applications, such as office suites
- Decision support and analytical systems for use on an individual workstation
- CD ROM applications
- Terminal emulation packages for both ASCII and 3270 emulation
- Desktop publishing software for a single user

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Exhibit IV-2 summarizes technology differences in the client/server market from when INPUT last surveyed the market two years ago.

Exhibit IV-2

Changes In Technology Over the Last Two Years

Issues	1993-1998 Report	1995-2000 Report
Networking	Many companies reported that network complexity was a problem.	TCP/IP is more widespread. Network management tools are maturing. Middleware to mask network complexity is gaining market acceptance.
Security	IS managers wanted C/S security to be like that found on a mainframe.	The Internet raises new security issues. Emerging products address user authentication, token card systems, Internet gateways and firewalls, virus detection, and encryption.
Reliability	PCs, servers and networks are hard to troubleshoot and unreliable.	C/S networks have become more complex and more tools to troubleshoot are being developed. Reliability of computers has improved, but tracking down C/S application failures across a network is still difficult and represents an opportunity for both service providers and software vendors.
Powerful workstations	Many found that PCs with Windows were slower than block mode terminals for data entry.	More powerful PCs continue to emerge. Counter to this is a trend toward simpler Internet browsing machines with less complex operating systems.
Scalability	Concerns were raised that many hardware and software solutions work well in a LAN environment, but cannot be scaled up.	Leading vendors have introduced new products at both the high and low ends of their product range (e.g., Oracle Enterprise and Workgroup Servers, IBM TCP/IP stacks for mainframes and OS/2) to support more scalable solutions.

Source: INPUT

Exhibit IV-3 summarizes differences in the user environment from INPUT's earlier (1993-1998) C/S market analysis. A new concern raised in this study is problems with systems that cannot handle dates beyond this century, known as "Year 2000" problems. Software that does not support dates after 1999 will need upgrading. This should hasten the move to C/S systems as some users will choose to reprogram their systems with more modern architectures instead of patching old code.

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Exhibit IV-3

Changes in the User Environment Over the Last Two Years

Issues	1993-1998 Report	Today
User training	Training people to use Windows and mice was an issue in many industries.	Windows applications are widely deployed and applications have become more standardized. Training is less of an issue. The Internet has the potential to create simple, point-and-click interfaces that can be readily understood.
IS/User department communications	Many companies reported that they had difficulties communicating between IS departments and users.	The role of IS has become clearer—supporting the infrastructure and promoting corporate standards. The user departments often have the budgets to finance applications. They may hire outside expertise. Lotus Notes, electronic mail, bulletin boards and Web sites have helped improve internal communications. Companies have established policies to handle information.
Information overload	Many buyers were confused at the range of choices for development tools, databases, and software architectures.	Users are still overwhelmed with information. There are more knowledgeable experts and professional services to support C/S. With the Internet and smart messaging that filters E-mail there is less need for organizations to store information locally; they can point to it from their own Web servers.
Intellectual property	This was not raised as an issue.	This is a growing issue as electronic publishing becomes a major application for C/S technology.
Pricing	C/S pricing was based on different models and was hard for users to understand.	Vendors have simplified pricing models and developed business models to support the customer. Microsoft has increased the pressure on pricing in the database market. Application vendors are moving to provide services, like functional outsourcing, to maintain their margins as software prices fall.
Accelerating the pace of business	Users believed that improving ordering times from weeks to days was significant.	Time-to-market pressures are greater. Users now want tasks performed in seconds instead of hours. Systems are programmed daily in some financial services institutions. Applications development times are significantly reduced.
Choice of partners	Selection of partners and alliances was an issue for vendors.	It continues to be an issue. Some vendors like Computer Associates are increasing their partnering efforts. Software companies have to find new categories of partners in entertainment, on-line services, news broadcasting and visual arts.
Channel management	Vendors were concerned with how to support VARs, retailers and OEMs without conflict.	Electronic publishers add to the complexity of channel management. Software vendors (e.g., Microsoft with Windows 95) offer pre-release final beta versions as products and on-line trial software.
Remote locations	Support for mobile professionals, remote locations and telecommuters is difficult.	More ISDN to the home and small businesses supports telecommuters. Mobile professionals can use wireless E-mail and paging devices on notebook PCs and PDAs.

Source: INPUT

2. Networking

Networking has failed to become any easier—if anything, it has become more complex. Companies have more experience in networking and a number of software packages make managing the network easier than in the past.

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Features allow for more network functions to be conducted from a central management console, including software distribution, traffic and protocol management and traffic routing. Additionally, middleware is starting to mask the complexity of integrating applications and multiple databases, which will make some network integration appear seamless.

3. User Training

Users are more sophisticated, have more experience—many of them have computers at home—and working with windows-based applications is standard in the industry. The possibility of easier-to-use OSs, the promise of Internet appliances, and the probability of Internet browser-launched software portends this becoming even less of a problem in the future.

4. Security

The Internet presents serious issues for client/server. How does a company allow customers access to internal networks and how does it protect itself from unwanted intrusions? As mentioned above, security will remain an issue. But the issue is being addressed by a number of products, including firewalls, token cards, better authentication routines, user training, and encryption, that will make this less of a concern in the future.

5. Communications Between IS and Users

This was a major concern two years ago, but not this year. Then, neither IS nor users felt there was very good communication. There is more awareness of the problem now. Committees were set up to deal with the problem and a number of strategies increase communication so that IS can take users' concerns into consideration. For example, USoft provides a tool for rapid prototyping that allows users a rough idea of how the screens will function before the application is completed. By allowing users to move menus and otherwise rearrange the screen, users' input can affect the final outcome. Users feel they own part of the process.

6. Reliability

Whereas PCs, servers and networks were viewed as complex, unreliable and difficult to troubleshoot two years ago, those concerns are less intense today. Tools like network protocol sniffers and network management software make C/S systems much easier to monitor at the network management layer. At the same time, C/S extensions to intra- and inter-enterprise applications lead to more complexity. C/S systems will continue to push the limits of reliability. Once a system becomes stable it will be extended and modified, leading to new problems. Hence, reliability is expected to continue to be an issue over the next five years, providing excellent opportunities for services and products that can troubleshoot distributed applications.

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7. More Complex Software Integration

Integration problems caused by developing software in different environments include difficulties in linking:

- Applications written in COBOL or C with higher level database environments
- Batch systems with interactive Windows-based systems, where APIs may only be specified in one direction
- OLE-enabled Windows applications to other environments, such as legacy server applications
- Workflow integration software such as Lotus Notes with transaction-based systems using CICS

Many more examples fuel demand for specialized tools that integrate different environments. Even with these tools, vendors need to choose carefully which environments to support. For users, there is an issue of which applications should be reprogrammed.

8. Scalability

Purchasing products from different vendors means that the convenient integration that is available from single-source solutions is often lacking. After completing their first-generation client/server projects, many companies now want to tackle larger enterprise and inter-enterprise applications. They want multiplatform, multidatabase applications that will be built for 50 users, scaled to 500 more and then rolled out into a global organization with 5,000 users, who require support in their native language. Expect to see more products that can address these needs in the future.

C. Vendor Concerns

1. Pace of Technology Change

Vendor constantly have to issue new releases to remain competitive and keep their companies growing. This puts schedule pressures on engineering. Microsoft had difficulty keeping Windows 95 on schedule, affecting many other software vendors, such as Symantec, who had to hold their Windows 95 products until Microsoft shipped. If vendors lack knowledge of winning technology, such as Netscape's Internet servers and browsers, their businesses are vulnerable. Even established applications vendors like Dun and Bradstreet face the defection of their installed base. Partnering is one way for vendors to be aware of technology shifts. Focusing and being best of

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breed is another strategy to attract industry influencers who can warn of changes in direction.

2. Choice of Partners

Although vendors have been partnering for years, there remains a need for partners that can co-market, resell their products and develop for different environments. Indeed, it will be more difficult to survive without partners. Vendors can no longer go it alone.

Critical to success in the C/S arena is the ability to support emerging products and interfaces from leaders like Sybase, Oracle, Informix and Netscape. Investing in partners means more than staffing an organization with an evangelist or strategic planning manager. It may mean financial investment in distributors and sales agents and it will certainly mean sharing proprietary information and co-developing projects.

Not only will vendors configure, set up, and test systems before they are installed to insure that they work before problems develop at the customer's site, but vendors will also work with companies outside the computer industry. Partnerships with cable and television companies follow services vendors' work with hardware and software product vendors.

Companies that develop software solutions will partner with technology companies for vertical solutions within market segments. For example, few would have thought that United Airlines would be offering a reservation system to the marketplace. A number of entertainment firms are building alliances with computer vendors to provide content and possibly more as they seek to develop the new interactive TV industry.

Contradictory trends are at work in the industry. On the one hand, customers are seeking to reduce risks by using a single vendor to provide more of the C/S solution. Single-source solutions reduce problems and require less integration. On the other hand, customers want to work with point solutions that frequently are best of breed, and hardware that demands open systems.

Is there a danger thatsingle-source solutions will lead back to the proprietary era of the early 1980s? INPUT believes that, long term, there may be more vertical integration of hardware and software companies, but over the next five years, users will demand open solutions. Expect interoperability to remain a requirement. At the same time, customers will tend to use one vendor to set up C/S systems to simplify management, reduce service costs, and have fewer companies to hold accountable for problems.

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3. Impact of Free Software

After years of inexpensive PC software packages, many customers are growing averse to paying for software. Internet browsers are given away free to build customer loyalty. Software is given away or sold near cost to build a base of consumers. Some companies are now planning on buying one copy of software and placing it on their servers with a multi-use permit. This reluctance to pay for client software is a concern to software vendors.

4. Network Performance

As companies seek new graphical and 3D means of using data in their data warehouses, demands on the network grow exponentially. Videoconferencing and multimedia, especially when rolled out throughout a company, place more demand on the network. System performance will suffer unless network developments keep up with the technology push from the C/S side.

Companies like Cisco Systems, Bay Networks and 3COM are working on switching technologies, 100Base-T Ethernet, ATM and Token Ring. They are developing new protocols to carry multimedia applications. Networking companies are seeking to address the increased needs for bandwidth-intensive and delay-sensitive applications, because they see network demands increasing as companies migrate mission-critical applications—which must include real-time updates, quick access to data, and fault tolerance—to C/S.

5. Downsized Accounts Are Costly to Support

Vendors will have a more difficult time selling into companies that have downsized too far. Some companies—in an effort to streamline and cut the fat—have cut into corporate muscle. This shows up when freelance programmers don't understand the legacy system environment or when the company can't grow with emerging market opportunities.

Many companies that downsized two years ago now want to invest in systems to maximize their effort. They saved costs, but now may find that they are not able to invest in technology to stay competitive. Some get acquired, others die. Many struggling midsized companies that downsized remodeled along the old business models. Many of the executives in these companies are sadly lacking in their understanding of technology. Although some of these upper managers may buy PCs or attend catch-up classes, much of the burden of education will fall on vendors.

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V

Market Forecasts

This section provides market forecasts for C/S software, for the U.S. and worldwide. This chapter explains how the C/S market is measured. Forecasts are made for the 1995–2000 timeframe for systems and applications software. Services and hardware forecasts are excluded.

A. Forecast Assumptions

1. Basis for Estimating C/S Software Revenues

The adjective "client/server" applies to a system architecture; when the term is applied to a software package or service, its meaning is often ill defined. Generally, with the exception of Internet applications, INPUT refers to an application as "client/server" when interoperable applications software is required on both a client and a server for the application to run. INPUT includes Web browsing as a C/S application, the client software being a Web browser, which is forecast under systems software. Software is counted in this forecast if it is used in a C/S system, supports a C/S architecture, or is used to develop C/S systems.

This section defines terms that enable the market to be measured:

- Client/Server-capable software
- Client/Server-enabled software
- Client/Server Non-enabled development software
- Internet software

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a. Client/Server-Capable Software

This is software that can run as part of a C/S system and can also run outside a C/S environment. An example would be MS Windows. It could be the user interface to a C/S system, or it could be used on a standalone computer. In the first case it would be counted in the forecast; in the second case it would not be counted. If it sometimes runs in a C/S system and sometimes runs standalone, then it is counted as C/S software. Legacy databases, office suites and software components may also fall into this category.

b. Client/Server-Enabled Software

This is software that has been specially programmed to support a C/S application. An example would be SAP's R/3 integrated enterprise software. This software will only be counted as C/S software.

c. Client/Server Non-Enabled Development Software

Software may not be capable of running in a C/S system, but it could still be used to develop C/S systems. For example, Microsoft's Visual Basic is a single-user application, but it may be used to develop a C/S application. Software that is used to develop C/S applications will be counted as C/S software.

d. Internet Software

Software originally designed for the Internet, such as Web browsers or Web servers, traditionally has worked on a store-and-forward basis, which strictly speaking does not meet some definitions of C/S where RPC connections are implied. However, INPUT's definition of C/S states that an application requires both a client and a server component to work. Under this definition, systems that use Internet technology are covered under the C/S forecasts. Hence, business applications that use Web servers and browsers and similar Internet technologies are included in these C/S forecasts.

2. Measurements Used in This Forecast

For this forecast, the market for software sold into a C/S application environment or software used to build a C/S application is measured. This is done by examining the proportion of new software products that are likely to be deployed in C/S systems. For application development tools, the market is forecast for tools and databases designed to create C/S systems, irrespective of how they are actually used.

INPUT forecasts user expenditures on software. For some categories of software, estimates of the market size were created by estimating software

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vendor revenues and marking up the prices paid by users according to distribution channels. For other categories of software, research from INPUT's earlier C/S reports and Market Analysis Program data was used.

3. Treatment of Software Vendor Revenues

- The forecasts here are for software products that are licensed to users, not for custom software that is paid for as part of a professional services (or contract programming) contract.
- Software license upgrades, leases and maintenance are included in revenues, unless the upgrade is included with professional services, in which case it is included under professional services and not a part of this forecast. For example, if Microsoft offers a $99 upgrade for Access, it is included here, but if a mainframe software vendor provides a contract at 15% of the purchase price for fixing bugs and technical support, then it is included in professional services.
- Service revenues of software vendors with a significant consulting business, like Oracle, are omitted from the calculations used to derive the market forecasts.

B. What Do the Forecasts Show?

The C/S market has exploded over the last few years. Strong market segments include:

- Databases
- Internet software
- Middleware
- Systems management
- Integrated enterprise applications

The forecasts show healthy growth in the Windows NT market. The server market for Windows NT operating systems software and utilities, forecast here under the heading "operating environment", is expected to grow ata a CAGR of 69%, from $146 million in 1995 to over $2 billion in 2000. Networking utilities as well as systems software add-ons will contribute to this growth.

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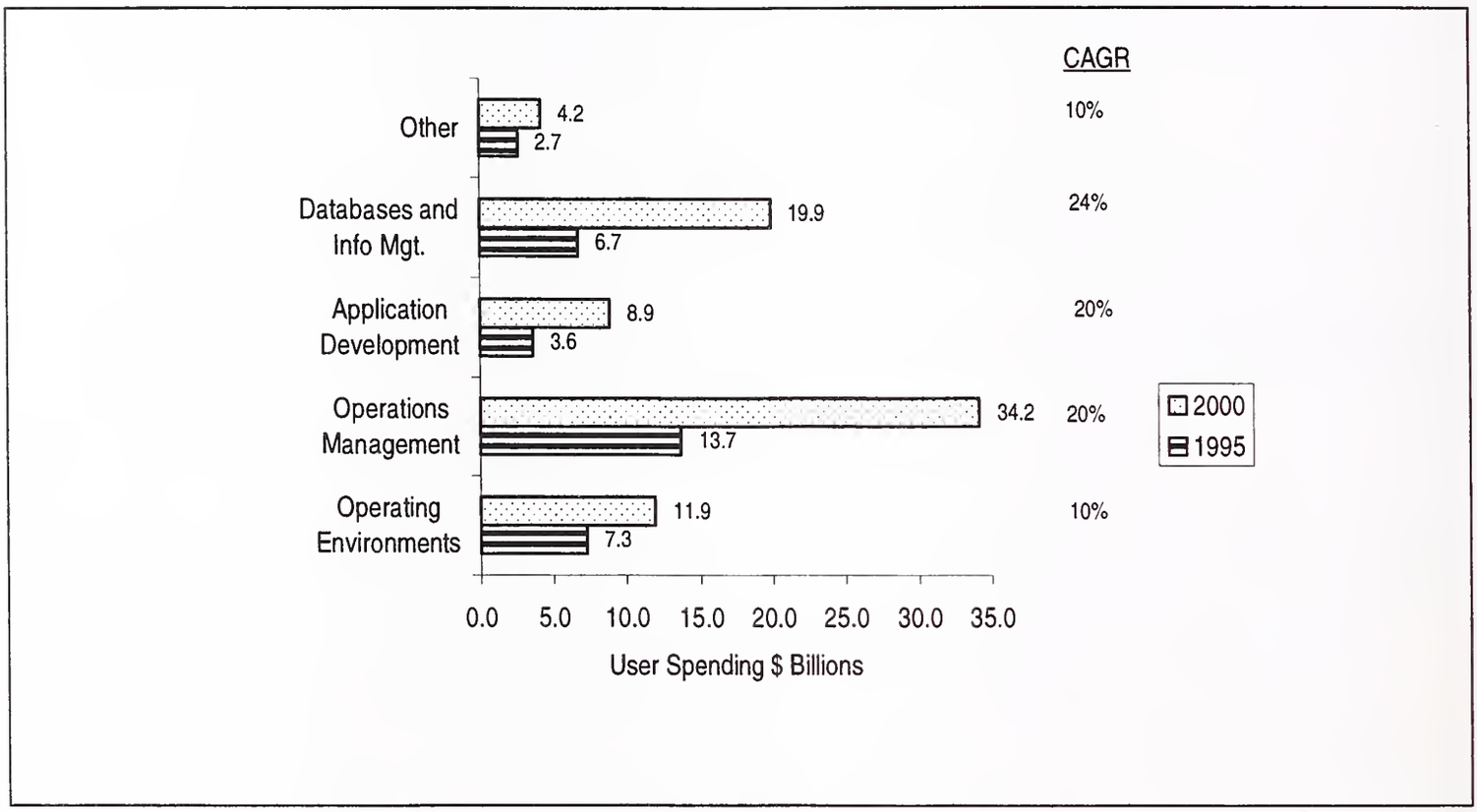
C. Systems Software

1. Forecasts by Category

Exhibit V-1 shows the worldwide C/S systems software forecast, broken down by category. The worldwide C/S systems market is expected to grow at a CAGR of 18%, from $34 billion in 1995 to $79 billion in the year 2000. The most rapidly growing areas are databases and information management. This is in part due to new ways of storing multimedia data and objects. It also includes Web servers.

Exhibit V-1

Worldwide C/S Systems Forecast by Category, 1995-2000



Source: INPUT

The systems software market grew faster than expected in earlier INPUT reports. This was in part fueled by the release of new operating system versions like Windows 95, the growth of the Internet, which requires support from databases, and the urgency with which corporations have adopted enterprise C/S applications.

The database market continues to explode. The need to store multimedia objects and the trend toward retrieving information from data warehouses are fueling this growth. Another factor in the operations management area is security software. Based on INPUT surveys of users and vendors, there is

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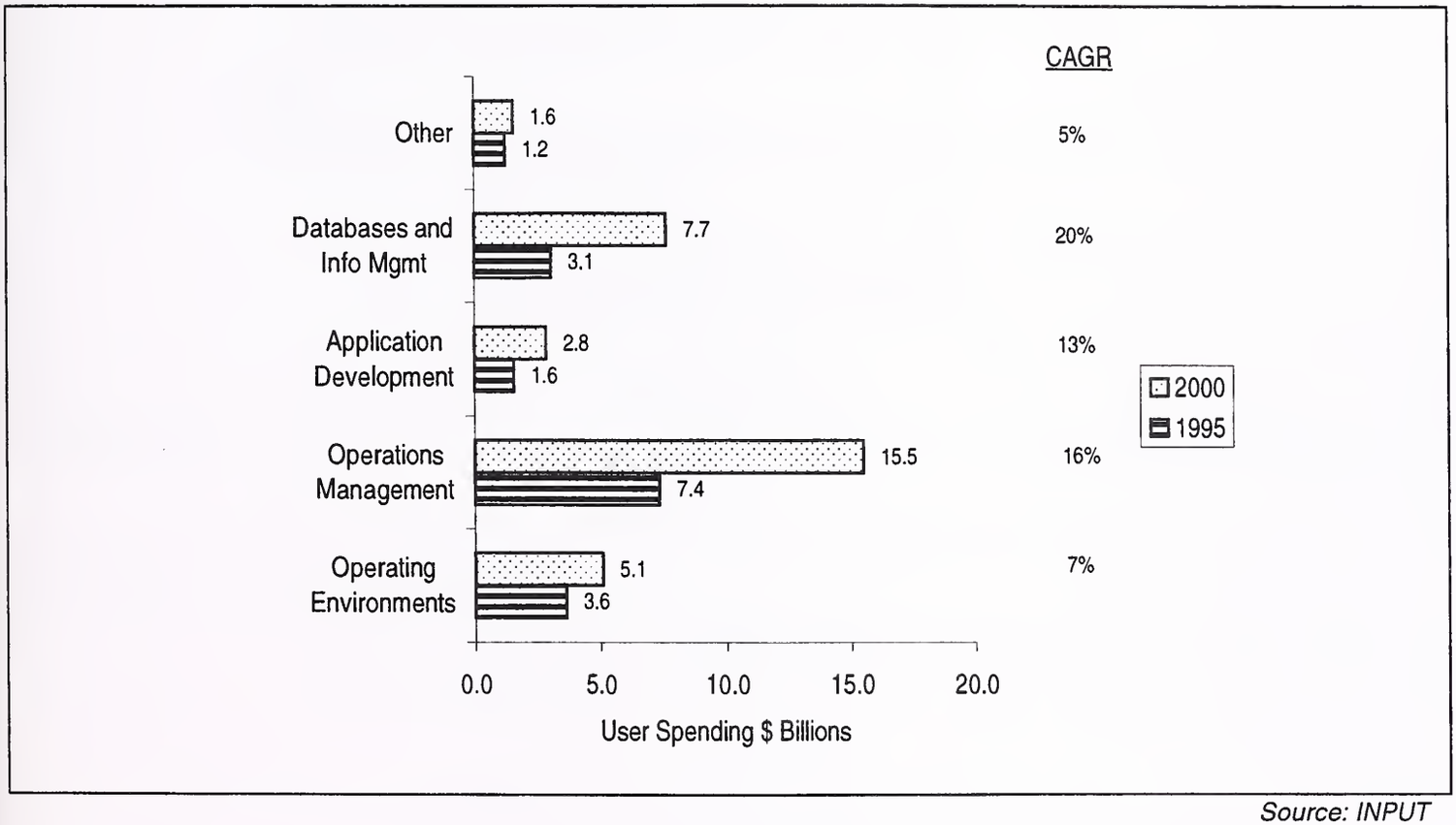
considerable concern over the security of C/S systems; corporations will increase their investment substantially in this area.

Exhibit V-2 shows the U.S. C/S systems software forecast broken down by category. The applications tool market will grow from $1.6 billion in 1995 to $2.8 billion in the year 2000, at a CAGR of 13%. New programming paradigms for supporting applications will evolve to create this growth. More users will become programmers. The total U.S. C/S systems software market is growing at 14%, from about $17 billion in 1995 to nearly $33 billion in the year 2000.

Exhibit V-2

U.S. C/S Systems Software by Category, 1995-2000



Source: INPUT

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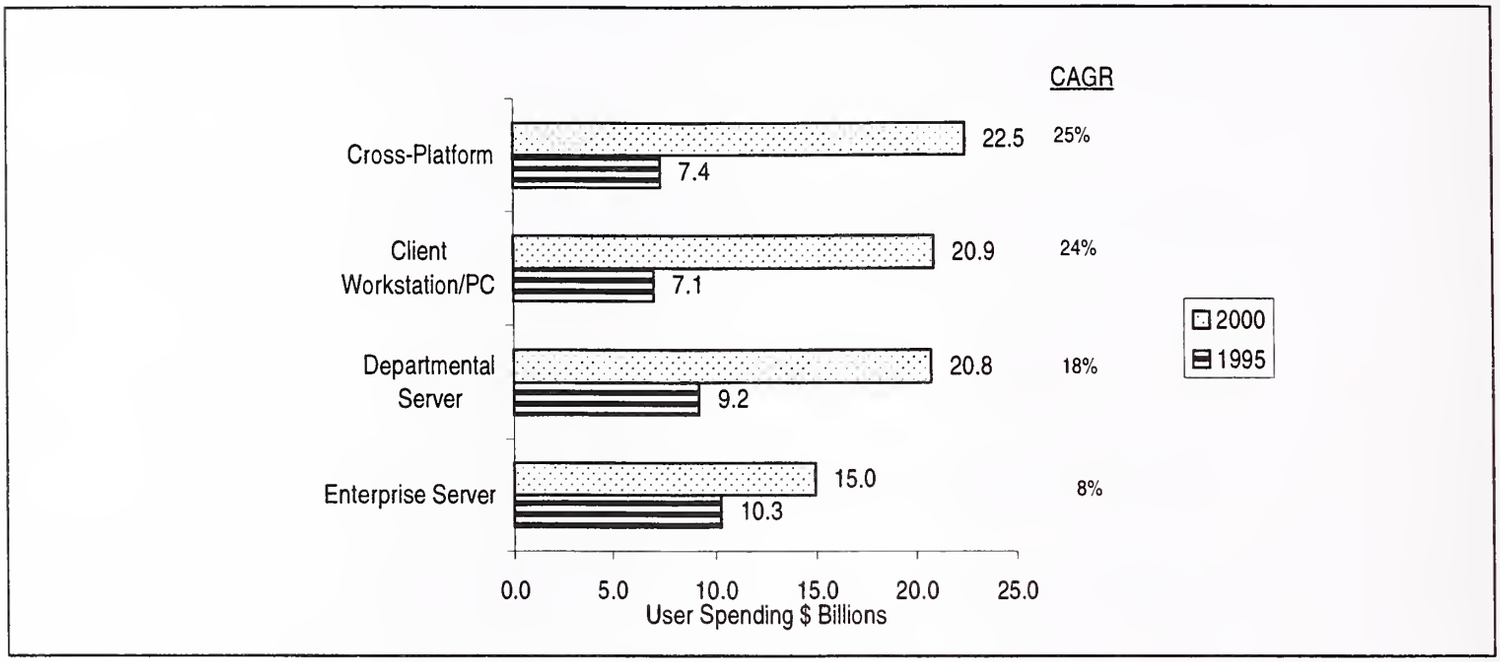
2. Forecasts by Platform

Exhibit V-3 shows the worldwide C/S systems software forecast broken down by platform. The enterprise server software market is growing at 8%, but the highest growth (25% CAGR 1995-2000) is in cross-platform software.

Exhibit V-3

Worldwide C/S Systems Software by Platform, 1995-2000



Source: INPUT

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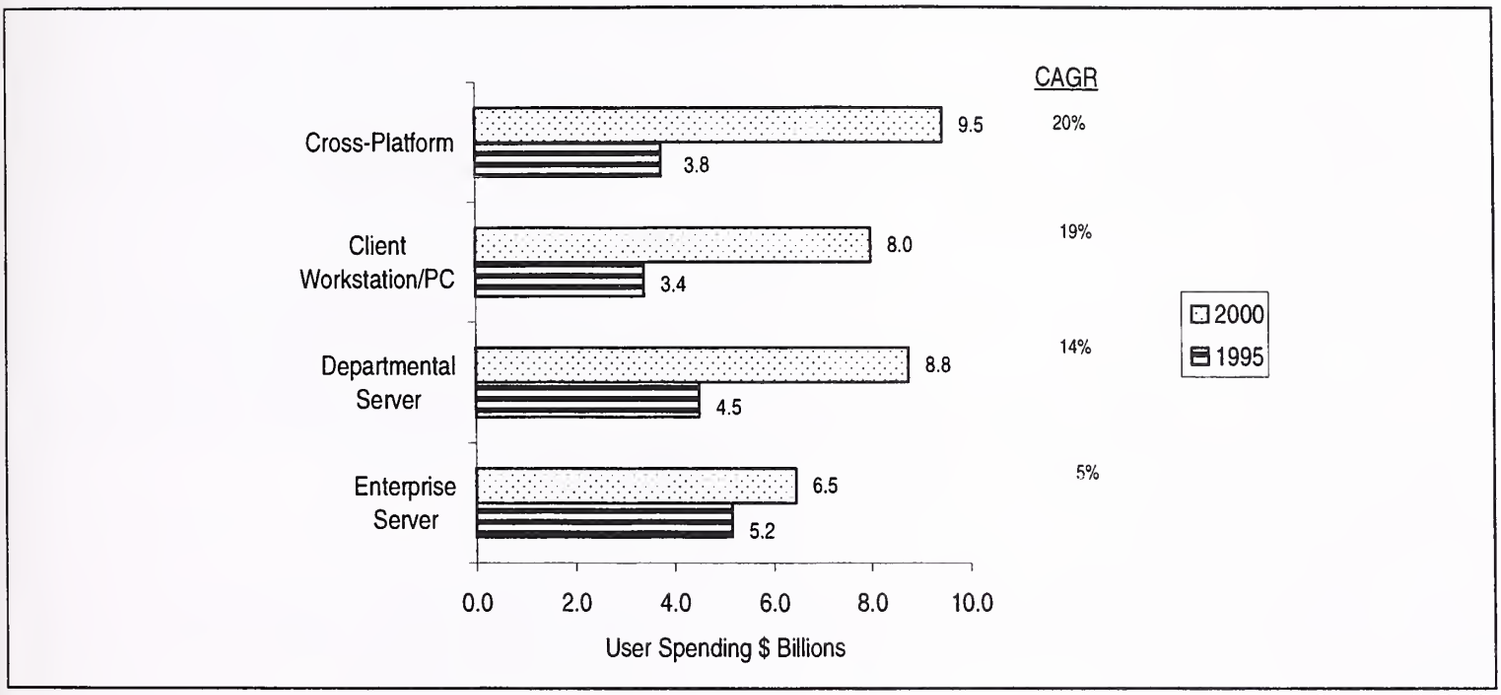
Exhibit V-4 shows the U.S. C/S systems software forecast broken down by platform. The trend is toward cross-platform solutions, where the most growth can be expected. This is particularly true with the advent of cross-platform languages like Java for the Internet.

Exhibit V-4

U.S. C/S Systems Software by Platform, 1995-2000



Source: INPUT

D. Cross-Industry Applications

Exhibit V-5 shows the worldwide C/S cross-industry software market broken down by application.

1. Accounting

Vendors like SAP and Oracle are integrating accounting systems with HR and manufacturing systems. They are leveraging their strengths, SAP in multinational systems, and Oracle in integration with the database. Both companies see opportunities for using the Web as a way to access their systems.

Best-of-breed vendors like Hyperion provide solutions that link accounting systems for consolidation. They also provide budgeting software. Niche opportunities around accounting systems abound. The ability to link smaller and larger vendors not only with EDI software, but with fully integrated ordering systems, is a major challenge. Enabling customers to place their own orders presents other opportunities. Interfacing accounting systems to

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billing systems for credit cards is another opportunity that is more attractive because of the Internet.

2. Education and Training

The education market is a stronghold for Apple. Out of seven respondents in the education market, five thought the Apple Macintosh was an important platform. Apple needs to nurture this success and hope that students will not desert their Macintoshes when they enter the business world. The education market benefits enormously from the Web as universities and colleges that understand how to collect, disseminate and classify information make it available to a wide audience. The challenge for these organizations is how to charge.

Securing large, constantly changing file systems is another college campus opportunity. By working with students and experimental departments, vendors can test leading-edge designs. Universities like Carnegie-Mellon and the University of Michigan were early C/S pioneers. More opportunities for supporting mobile users are emerging.

3. Engineering and Scientific

Workstations are never powerful enough in this market. Intergraph is launching a thrust against the established workstation vendors with systems based on Windows NT. These are somewhat pricey systems, but can be configured with Intergraph's software for such applications as Geographic Information Systems.

Engineering markets are merging with commercial markets, in that many office professionals are requiring more analysis as information systems begin to resemble classical engineering applications. For example, simulations that may have been carried out by a process engineer may now be applied to business processes.

4. Human Resources

This function is being deployed more widely in corporations, providing employees at their workstations with access to benefit and other HR information. The Web provides a cost-effective interface for HR systems. Policies and other HR information can be placed on servers for widespread access via intranets.

Job applicant systems based on Lotus Notes will migrate to the Internet, as it provides a convenient way first to advertise jobs, secondly to receive resumes via E-mail, and thirdly to distribute resumes once they are received. Expect to see more customized HR systems based on the Internet.

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5. Office Systems

Workflow systems are increasingly being deployed, the most widely used being Lotus Notes. Lotus Notes is being transformed into a document storage and management system for the Internet with InterNotes. However, Web competitors are emerging who can challenge IBM's position with Notes. Office suites are already mail enabled and are being Internet enhanced for collaborative computing, where users share information as they work.

Expect to see office software becoming the lynch pin around which vendors supply applications and add-on features. Microsoft has already started to capitalize on this market by offering add-ons to Microsoft Word on the Web. Interfacing traditional office packages to databases is already widely established, with Microsoft Excel being a useful front end for databases and decision analysis packages on servers.

6. Planning and Analysis

The OLAP (on-line analytical processing) trend is forcing companies to rethink how they analyze data. Visual tools that enable users to fly through the data, like Silicon Graphics' InfoNavigator, require powerful workstations to be truly effective. Expect to see many lower cost systems for decision support and be prepared to upgrade PCs to workstation-class machines with at least 32MB of memory, dual page displays and fast Pentium Pro or PowerPC processors.

Integration of data warehousing systems for planning with reporting systems will present major opportunities. Packaged software suppliers will be able to provide canned solutions that can be readily customized by the user.

7. Sales and Marketing

Supporting both desk bound and mobile sales professionals is a challenge. Notebook PCs are now easily connected to a LAN. Increasingly, as evidenced by market leader HP, infra-red will be another alternative for connecting the corporate traveler to office systems.

Sales support packages need to be integrated with customer service, ordering and lead management systems. The Web provides an environment for integrating the mobile sales professional into the corporation. Companies that invest in sales force automation often fail to integrate the systems into the desktop corporate infrastructure. This is one area in which object technology will bring breakthroughs to innovative corporations that can really maximize a sales person's time.

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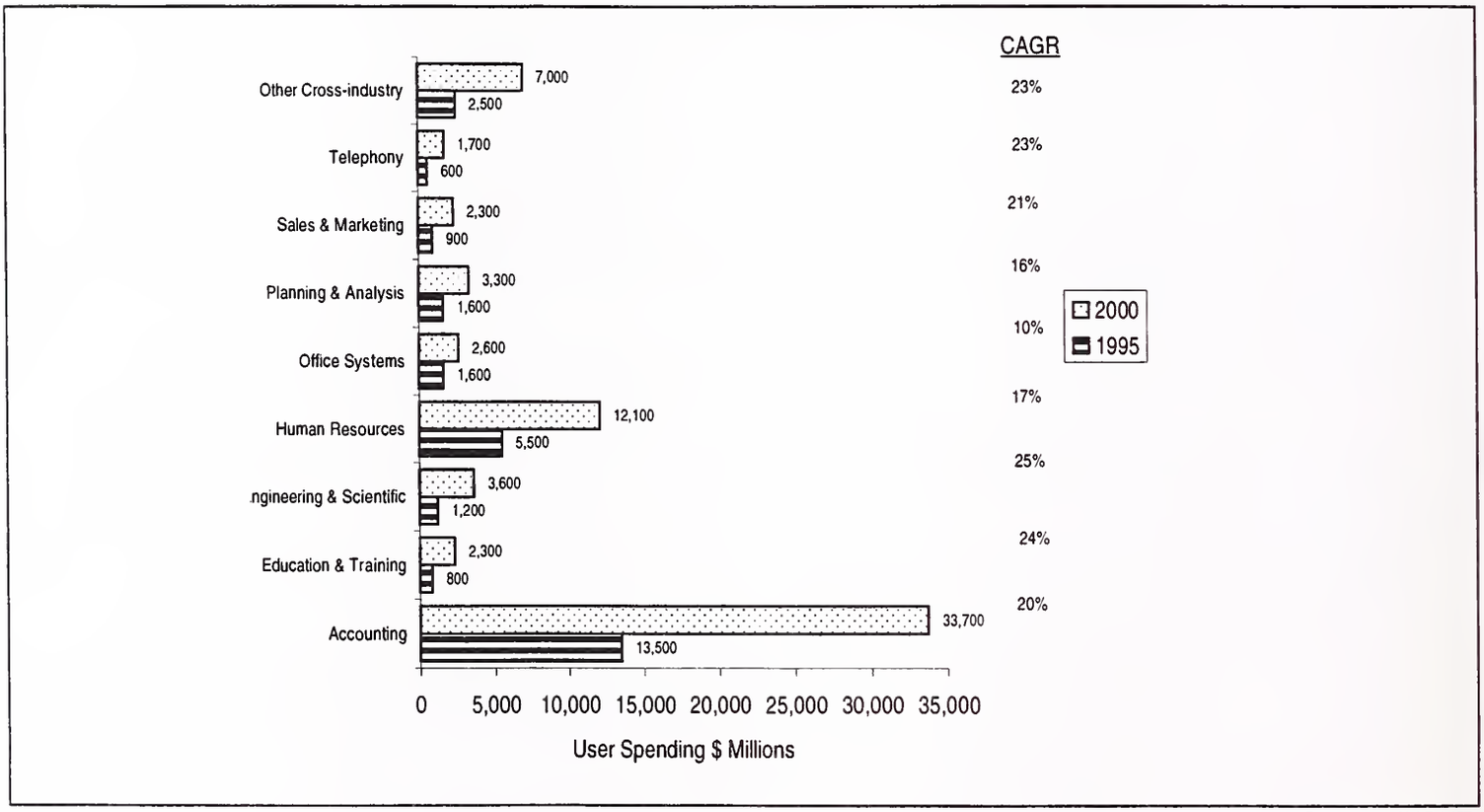
8. Telephony

Wireless communications continue to expand. New hand-held devices to support mobile tasks can be expected for both short-range and long-range communications. Integrating office telephones with computers is gradually happening. Phone features are being added to the Internet, but the PC is still not reliable enough to function as a phone. This could change when a reliable OS, like Windows NT or UNIX, becomes the foundation of a user's workstation. There is opportunity for making telephone interfaces more easily integrated into desktop applications. In some areas, such as telemarketing and customer service, this has been successful. The next five years will see more applications being integrated with telephony. The telephony category is a new category that is not traditionally included in INPUT's Market Analysis Program forecasts.

Exhibit V-5

Worldwide C/S Cross-Industry Software, 1995-2000



Source: INPUT

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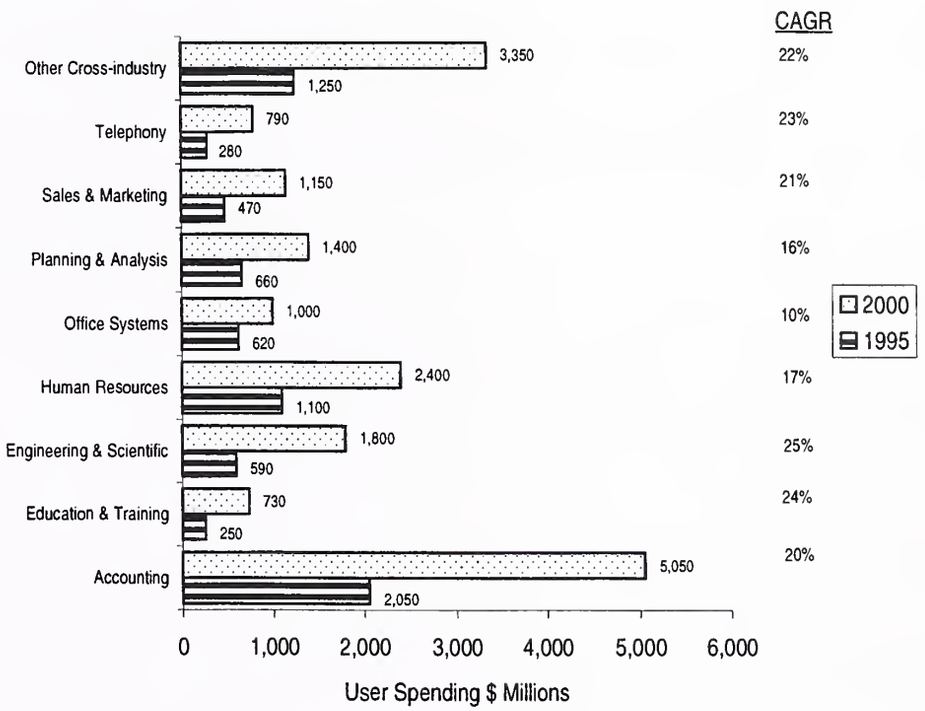
The "other cross-industry" category is not usually included in INPUT's forecasts. However, given the range of new process-oriented applications that run across traditional organizational boundaries this category was included. It includes document imaging systems, for example. Exhibit V-6 shows the U.S. C/S cross-industry software forecast broken down by application.

Exhibit V-6

U.S. C/S Cross-Industry Software, 1995-2000



Source: INPUT

E. Vertical Applications

Exhibit V-7 shows the worldwide C/S vertical applications software forecast broken down by market segment. The growth of the Internet is expected to fuel tremendous growth in telecommunications. The telecommunications segment includes cable TV and other media industries using both wireline and wireless communications. The software required to support these systems is predominantly C/S, and tremendous growth opportunities in this segment are foreseen, with a 50% CAGR for C/S software spending over the next five years as legacy systems are replaced and rewritten.

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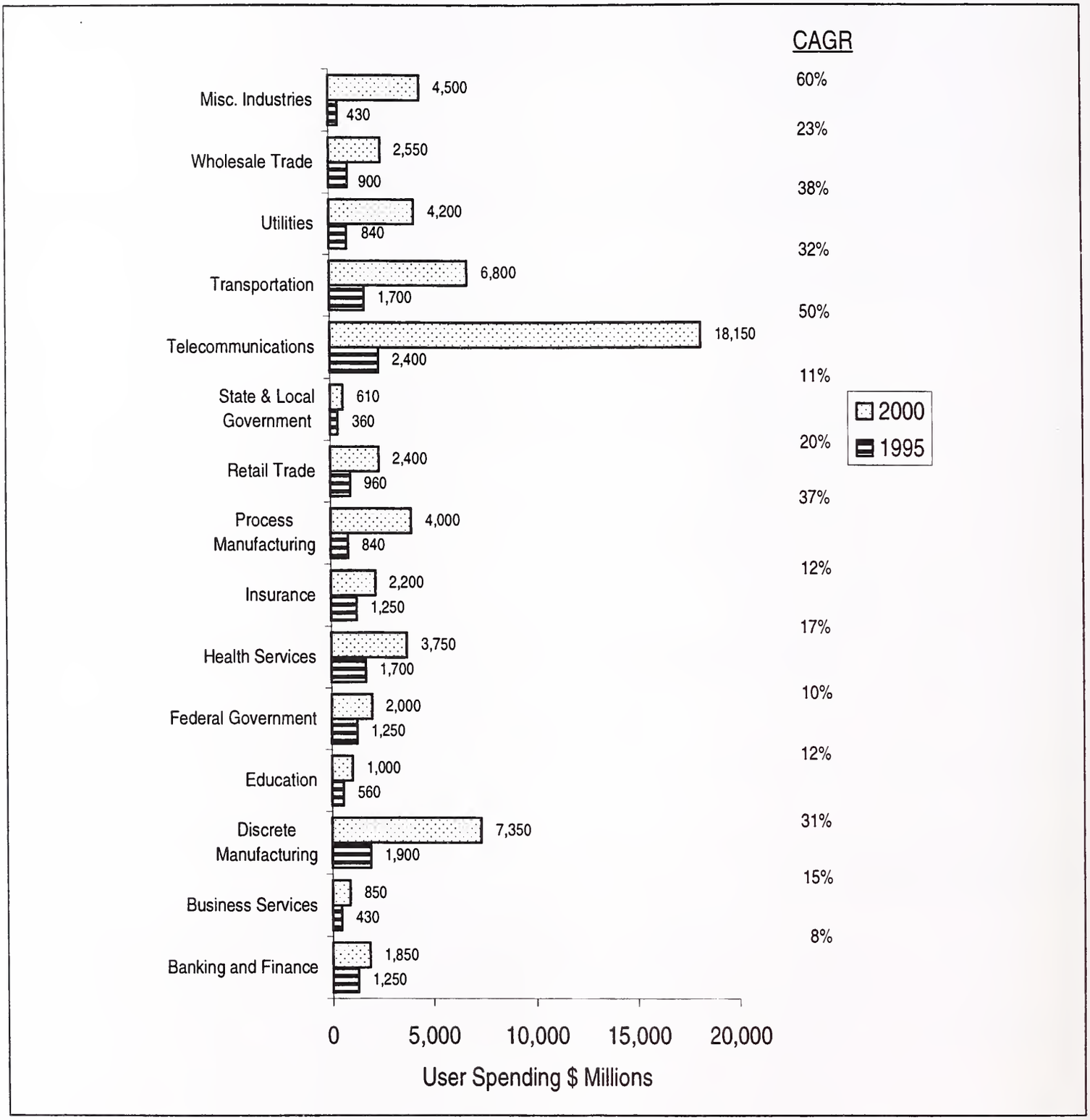
Exhibit V-7

Worldwide Vertical C/S Applications Software, 1995-2000



Source: INPUT

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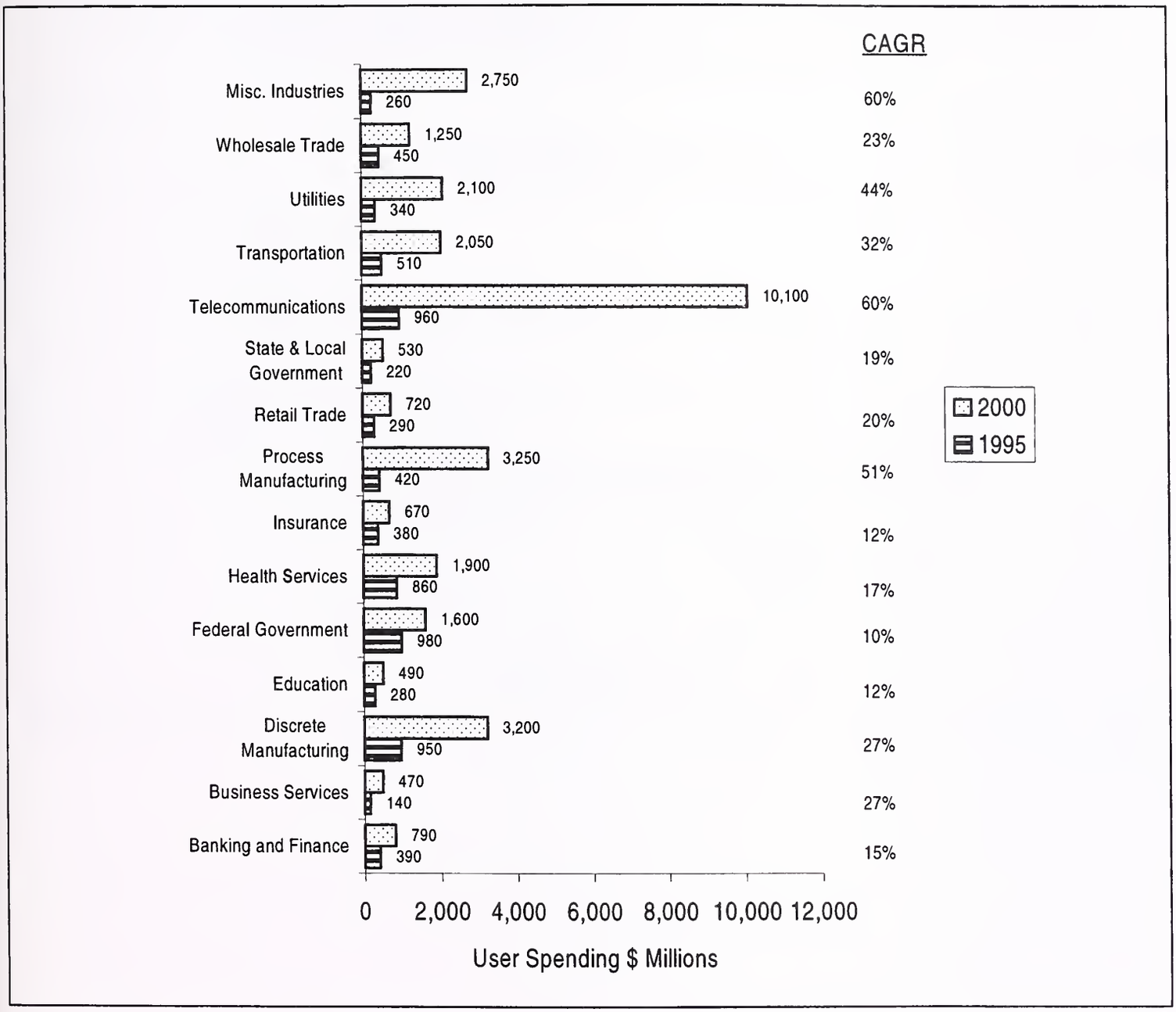
Exhibit V-8 shows the U.S. C/S vertical applications software segments.

Exhibit V-8

U.S. Vertical C/S Applications Software, 1995-2000



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F. Total C/S Software Market

Exhibit V-9 shows the worldwide C/S software market, by platform. INPUT subscribes to Microsoft's view that many corporations will choose to run their operations on small, networked servers. However, the enterprise server market is healthy, with an insatiable appetite for machines that can store massive corporate databases.

Exhibit V-9

Worldwide C/S Software, 1995-2000

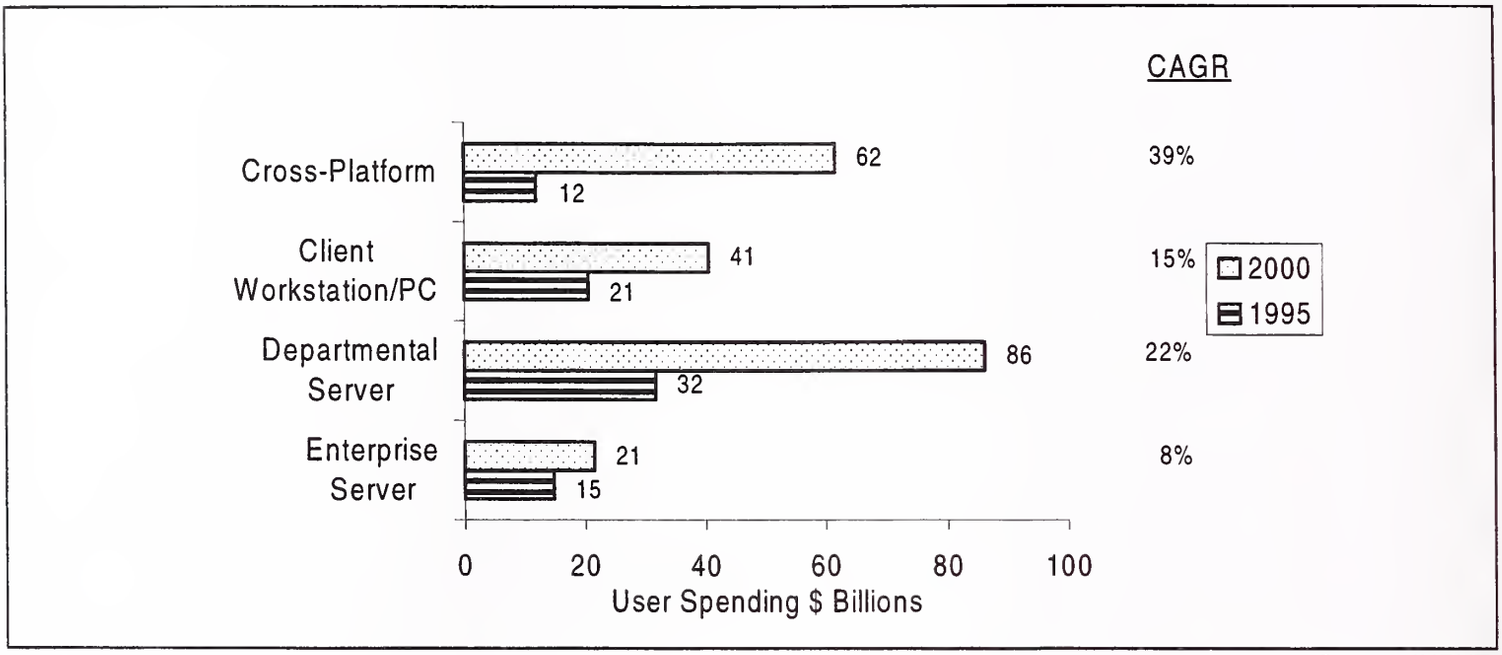

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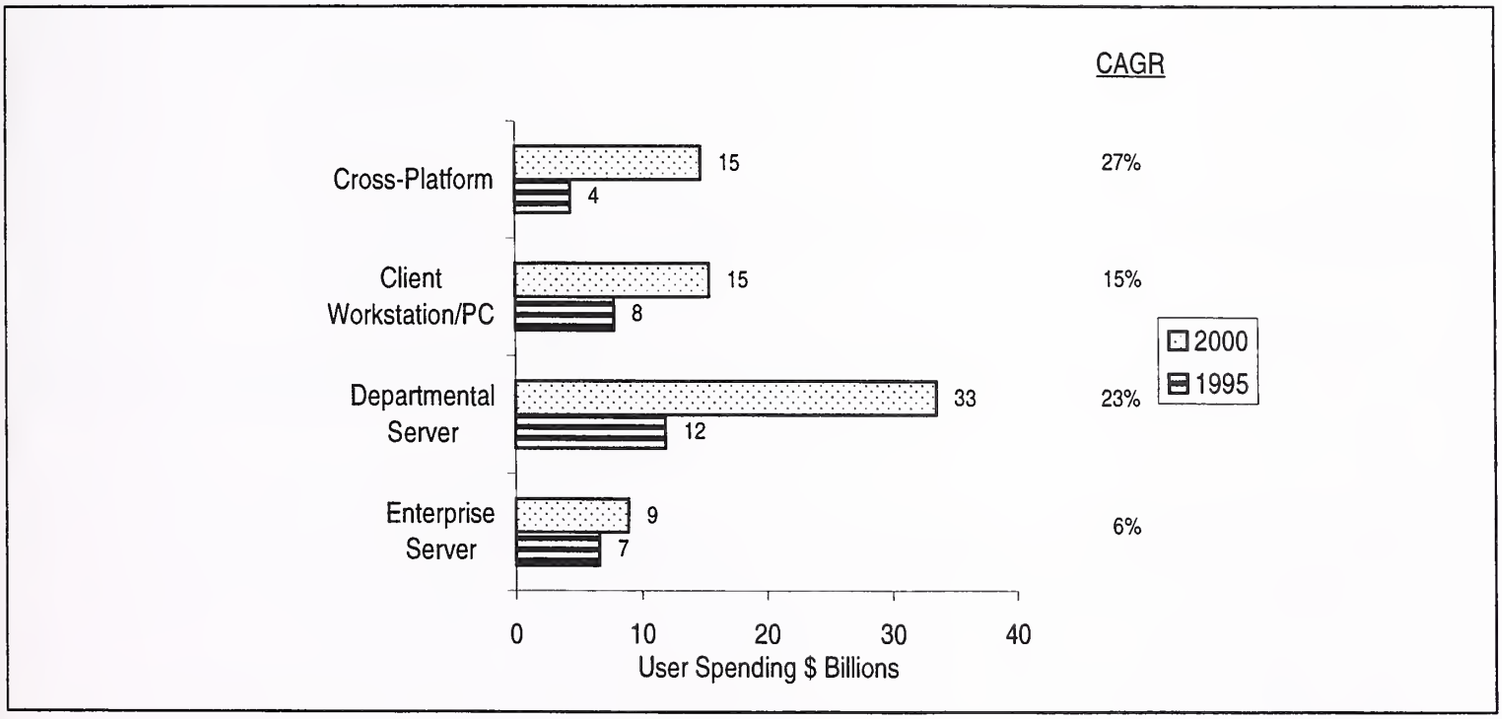
Exhibit V-10 shows the total U.S. C/S software market. The enterprise server market is more mature in the U.S. than in some other parts of the world, hence the growth—6%—is not as great as in the worldwide forecasts, where the CAGR from 1995 to 2000 was 8%. The fastest growing segment is the cross-platform market, with a growth rate of 27%, the departmental server market being next with a growth rate of 23%.

Exhibit V-10

U.S. C/S Software, 1995-2000



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VI

Opportunities and Risks

This chapter presents opportunities and risks for C/S solutions vendors and users.

A. Opportunities for Vendors

1. Integration

For enterprise-wide systems, software developed in-house or from third-party vendors must be easily and seamlessly integrated. Despite the availability of several single-vendor solutions, like Oracle's Applications or SAP's R/3, and best-of-breed solutions, like Hyperion's Financials, integration remains a problem. Too often, software tools in single-vendor suites don't integrate well. Users require integrated suites that enable them to develop and integrate custom user interfaces that have a consistent look and feel to the user, even though they may have come from multiple vendors. Vendors that provide this integration are likely to do well in the marketplace.

The visual application development tools marketplace is crowded with 50 to 60 vendors. Expect to see market consolidation, mergers, and buy-outs. As the need for higher level C/S tools grows, vendors that can migrate tools to the higher level will be more successful. Users need tools that can handle the performance levels of high-volume, mission-critical applications as they migrate from legacy systems to C/S.

There is room in the market for mid-sized integrated applications vendors between global vendors like SAP and geographically restricted small boutique vendors. Mid-sized companies that can develop quality applications and the tools to build them that are portable, include Internet support, and are scalable, will thrive. These tools will need to enable systems to be built that model business processes, rather than traditional divisions of labor. For

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example, a demand chain management system that links customer orders to suppliers' inventory systems presents an opportunity. Create software can be partitioned between different client and server machines after being written, so that systems may be easily reconfigured. New systems that accomplish integrated service desk, inventory management, sales history, manufacturing and product data will be in demand.

2. Solutions for Smaller Companies

As C/S systems become more flexibile, they help companies of all sizes reorganize their business processes. More small companies will employ C/S systems to their competitive advantage. For example, SAP is starting to target smaller companies with Windows NT solutions. These companies do not have the professional staffs or resources to support their business processes and systems. Hence, there will be outsourcing opportunities for companies that can deploy, upgrade and support software for smaller companies.

3. Targeted Products

Vendors that offer C/S applications for managing accounting, personnel and manufacturing—such as SAP and PeopleSoft—are seeing tremendous growth as large companies favor more solid vendors. Smaller vendors will experience difficulty as these large vendors push into small and mid-sized businesses. Opportunities will exist for carefully targeted products for smaller companies.

4. Vertical Market Solutions

New C/S applications are customizing traditional cross-industry applications, such as accounting, distribution, human resources, E-mail, groupware and imaging applications, for vertical markets. For example, some vendors, including Oracle, will be offering far-reaching solutions within industries that include:

- In oil and gas industries, purchasing, marketing and billing of natural gas, reporting, contract processing, vendor tracking
- In financial applications, margin calculations transaction management and currency conversion
- In chemical plants for process control, thermal heat conversion and analysis

5. Object-Oriented Tools and Repositories

As the pace of business quickens and business models evolve over time, application tools must be able to mirror this change. Tools with strong

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prototyping capabilities that interface smoothly with legacy systems will have an advantage. One of the best ways to achieve quick, reliable results is to reuse code in the form of objects. Vendors that integrate objects in their tools and build repositories for quickly and easily locating reusable objects will have an advantage. Likewise, vendors that deploy smart agents across the network so that entire application development tool sets do not have to be replicated across many servers will do well.

Vendors need to be constantly watching the evolution of distributed object and messaging architectures such as CORBA and OLE COM. They also need to consider creating applications in Sun's Java or a similar cross-platform language. They need to consider where the Internet provides an appropriate solution and where more traditional C/S architectures are required.

6. Management Solutions

Three groups are vying for market share in C/S systems management:

- Hardware vendors are managing multivendor systems and networks with interfaces and tools from their own platforms.
- Third-party software vendors are building vendor-neutral, general-purpose frameworks.
- Small software vendors selling niche tools are targeting specific areas, such as rapid recovery.

With IS departments adding personnel and increasingly relying on users with little training to manage C/S systems, there is a greater need for less-cryptic, graphical, user-friendly interfaces. Vendors providing systems management tools with powerful workflow managers that schedule routine maintenance or application monitors that identify bottlenecks provide emerging opportunities. With the costs of maintaining a C/S system generally high, vendors that can demonstrate cost savings in both the deployment and maintenance of a system will be at an advantage.

B. Opportunities for Users

1. Use Web Browsers and Internet Technology

Deploy Web browsers on the desktop and train users in accessing Internet resources. Train programmers to integrate Internet code, such as Java applets, into corporate user interfaces and internally developed applications. Understand how applications function on the Internet and how public domain software can be downloaded from the Internet to solve business

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problems. Update software to take advantage of Internet connections and resources for collaborative work within the company. Protect corporate networks from viruses and rogue agents. Internet technology is best suited for applications that do not require complex programming of the user environment. Data entry applications that require complex data validation may be better handled with traditional tools.

2. Connect Branch Offices

As ISDN becomes available and the cost of connections comes down, branch offices can connect to a company's internal servers remotely rather than relying upon slower modem connections or more expensive leased lines. With companies searching for better ways to connect to the customer, branch sales offices will need up-to-the-minute information. They need systems to help them:

- Qualify clients on the phone
- Track shipments
- Determine availability of products
- Troubleshoot customer problems

Such connections build customer loyalty, lead to recommendations, and save money by solving problems immediately.

3. Seek Integrated Solutions

While best-of-breed software products often provide superior solutions, they are not always easy to integrate into the company's basic business model. When building applications or buying software, seek solutions that easily integrate into the enterprise. Demand that products from the same vendor integrate with the company's other products. Ensure that applications can be migrated easily from one platform to another, where technically possible.

4. Shop for Packaged Software

Packaged software is becoming increasingly available not only for business functions, but within industries to provide complete solutions for integrating the C/S model. These software packages are designed to be C/S applications and connect different platforms. Users need to refrain from developing custom solutions when minor adjustments to their business processes could help them benefit from new software packages. It is often easier to retrain people to fit a packaged software solution than to customize software to accommodate antiquated business processes. Before developing a custom solution, a user should always examine packaged software alternatives.

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5. Develop a Security Program

Many C/S developments are requiring greater attention to security than the legacy systems required. As the C/S model connects internal networks and connects to the Internet, a company's computer system becomes vulnerable to intrusion from unwanted outsiders and misuse by internal employees. C/S security begins with understanding risk versus security cost. It requires user awareness of:

- The dangers of unwanted access
- Methods of entrance into a corporate environment
- How frequently log-on procedures are updated and changed
- What information needs to be protected and how much that protection costs

In today's C/S environments, it is vital to establish an overall security policy and then be prepared to implement it. This usually requires the full support of upper management. In addition to securing individual transactions with encryption, token card systems limit log-on to the most valuable C/S systems and firewalls protect internal C/S systems from outside intrusion or separate internal C/S systems from other departments. New products will continue to emerge and change as the hacker underground probes a company's security system. Complete security for C/S systems will remain a moving target.

C. Risks for Vendors and Users

1. Underestimated Budgets

Often, initial C/S budgets are underestimated. INPUT research shows that these budgets are growing faster and are larger than non-C/S budgets for comparable applications. Organizations will benefit from budgeting for support and testing as well as software and hardware. This risk can be mitigated by clearly understanding the cost of each project phase in terms of personnel, software, hardware, testing, support and integration. Vendors can alleviate the problem by supplying sample cost models.

2. Premature Project Cancellation

Managers need to understand that C/S systems require advance planning and that the results are not always immediately measurable. If management does not understand the development cycle and cancels a C/S project prematurely, both money and time can be lost. Developers need to ensure that a plan is developed to show progress toward a complete system in well-defined phases.

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3. Staff Support

Systems administration requirements are not well understood when many C/S projects are started. Besides training employees to use applications, educating operational business staff in managing, supporting and running applications becomes a huge issue. This means that business models of systems support processes become important. The risk of too few support staff can be reduced by ensuring that user organizations incorporate support functions into their overall business plan. They then need to organize IS staff and system administrators appropriately.

4. Overdependence on Vendors

Users can become overdependent on database and operating system vendors as they seek simplified procurement and a few key vendor relationships. Open systems standards allow users to choose hardware as well as various operating systems. In developing C/S architectures, users have to decide to what extent they want to rely on such vendors as Microsoft, Sun Microsystems, Oracle or Sybase, and what alternatives they can use. Systems are sometimes not as open as they first appear.

5. Networks Are Hard to Extend and Reconfigure

C/S systems are tightly integrated with network functionality. Unfortunately, many networks grew within workgroups and departments before finding it necessary to connect to the larger enterprise. Hence, many networks are configured with insufficient testing, making them unreliable and insecure. To reduce this risk, high-quality network management personnel, both internal and external to an organization, may be necessary to reconfigure the network and make it function properly on the enterprise level.

As WANs and LANs converge, both relying on TCP/IP protocols, managers are tempted to cut corners to simplify networks. Networks must be segmented, protected and configured to simplify administration, organize data storage and support network expansion. There is a temptation to believe that with large intranets and internets there is less need for data organization and that agents will find the right data, for example. Without defining management boundaries clearly and understanding network hierarchies, users will have difficulties. Vendors with experience in managing large complex corporate or telephone company networks will be at an advantage in supporting users with upgradeable network solutions.

6. Users Are Inadequately Trained

Users are either not trained or unwilling to take the initiative to learn new C/S systems. IS departments can provide initial training, but the full power

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of C/S systems can only be exploited by the users. Rapid application development (RAD) features of software tools allow time for users to suggest system improvements and enhancements that give them a stake in the new C/S model. In particular, newer applications provide scripting languages with which users must become familiar so that they can automate their work.

Although intense training is usually given when a system is deployed, ongoing training is too often overlooked by the users or the company. Users with flexible systems, such as those found in decision support environments, need to have significant time, for example one hour a day, set aside in the initial phases of system deployment to learn how to use the system to its full potential.

D. Recommendations for Vendors

1. Invest in Integration

Either directly or with appropriate partners, ensure that ease of integration is a key product feature. First, ensure that enough integrators are trained to support your product. Then put as much as possible of the integration into software products, sample code and templates. Where possible, enable users to undertake their own integration. Provide software to support integration with key APIs (application programming interfaces).

2. Broaden Product Line to Small Business and Vertical Market Customers

Consider how a product line can evolve. Software vendors typically broaden their product lines by platform or number of users. For example, one can purchase Oracle for the enterprise or Oracle for the workgroup. Evolve the product line with vertical variations, as Oracle is doing with its C/S applications group. Provide products that can be supported by branch offices and small businesses. Make these products interoperable with systems used by business partners.

3. Reevaluate Distribution Channels

Sybase is undertaking a major restructuring of its distribution channels as it seeks to bring its database products to a wider range of users. Microsoft already has strong mail order and retail distribution channels. The type of C/S solution sold and its typical customer will determine the appropriate channels. As distribution chains shorten and companies become closer to the customer, middlemen that do not enhance the product provide little value. Look for resellers that provide systems integration expertise or create their own products on your platform.

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4. Include Software Management Solutions as Part of the Whole Product

Typically, a software product consists of a license, upgrades, bug fixes, training and support. Systems administration tools provide opportunities for add-on products, either from a third party or from the original software product developer. In a C/S system, administration goes beyond tracking network management data; it requires an understanding of the application and how it can be:

- Tuned to perform better
- Changed to support more users (for example, when an acquired company starts to use it)
- Supported in branch offices
- Updated
- Integrated into upgrades of new applications, like MS Office for Windows 95
- Fixed rapidly, even with a temporary fix, when it breaks

Vendors must be able to recommend systems management solutions to their customers.

5. Provide or Recommend Security Products

Every vendor, whether of systems or applications software, needs to understand how security products can be sold to enhance the basic software. Some vendors will choose to resell products, others will build their own, and some may choose to recommend third-party products. There are tremendous opportunities for application vendors to understand the impact of firewalls on their products. In some cases, tunneling through a firewall may be appropriate; in others, the application may be protected by the firewall. If the application needs to run across a firewall, then it needs to be tested for compatibility. Passwording and making applications work with single sign-on solutions is another opportunity for vendors.

6. Invest in Distributed Objects

Vendors, if they are not already doing so, need to invest in distributed object management. This goes beyond developing systems using object-oriented software. Vendors need to gain rights to object frameworks, software libraries and information content that they can market in their area of expertise. They also need to structure their programming teams so that experienced developers can create objects and less experienced programmers can integrate them.

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7. Invest in the Internet and Networking

Vendors need to understand how the Internet affects their competitive position. In some cases new competitors will emerge; in others, there will be new product opportunities.

Networking is still a major concern. C/S systems are not as easy to install as PBXs or terminal-based systems. Users, especially smaller users, want plug-and-play applications. Major users need to access massive databases and often convert them to other platforms. Methodologies, tools and software that simplify C/S networking will continue to be in high demand.

8. Invest in Partners

Vendors need to have a wider range of partners to support the content embedded in their applications, third-party tools, distribution and multimedia marketing. Software and hardware companies need to consider relationships with other entities—for example, banks if they do financial software. The range of necessary partners has expanded in the last two years.

E. Recommendations for Users

1. Redefine IS Support and Administration

The support of burden for C/S systems is often so high that users need to be part of the solution. IS departments need to understand what can be supported centrally and what is best supported remotely. The Internet, for example, provides technical support that may have been provided internally by a corporate help desk. Global dissemination of information means that corporations have to rethink how they give support to their users and from whence they purchase it.

2. Understand Which Applications Can Benefit from Internet Technology

Not all applications will benefit from Internet technology. Users need to understand where it can be best applied; for example, in sales support, order entry, E-mail or technical support applications.

3. Redefine the Role of Programmers

In C/S systems, senior programmers must also be system architects who design and write software. Programming and systems design are converging as more powerful distributed object-oriented environments emerge from companies like Sun (NEO), IBM (SOM and DSOM) and NeXT (OpenStep, Enterprise Objects, Web Objects). IBM, for example, views its VisualAge

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Smalltalk-based development environment as a strategic development platform. These tools will evolve to combine object-oriented design with Internet-based applications development.

4. Understand Distributed Object Support

A few years ago, the choice of platform was based on hardware, then on the operating system. It then moved to databases and communications software. It is now based on distributed objects, the Internet and messaging. Repositories and management of distributed objects will become a critical area for many IS organizations. By working closely with systems integrators, who already have considerable expertise in this area, corporations will be able to choose whether to outsource or develop their own expertise in distributed object management.

5. Manage C/S Applications Development and Ongoing Support with a Business Plan

The C/S system implementation process is cyclical. Workstation software and servers can be upgraded without users noticing. Users must plan for incremental development and modular software upgrades over networks. By using a business plan to manage the deployment of C/S systems, users will be less likely to be surprised. Many early C/S systems were built without regard for business models. In some cases, this led to extremely efficient systems that propelled a company to a leadership position; in other cases, lack of senior management understanding of the investment meant that C/S projects failed. By managing application development that supports a business plan, including how the solution is marketed internally and financed, users can expect a smoother path to future C/S systems.

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A

Definitions

This appendix provides definitions of vocabulary used in the report.

A. Glossary

More definitions can be found in INPUT's *Definition of Terms*.

Agent	An agent is a set of instructions that can carry out tasks automatically. It is usually written in a high-level language script and may run across a network to send messages or find information.
API	Application programming interface—this provides specifications for programmers.
Applet	A small application that may be embedded in another application; for example, Microsoft's MS Graph is a graph program used in the MS Excel spreadsheet and the MS Powerpoint presentation package.
Client	When used in C/S it refers to the computer platform accessed by a user, such as a PC, workstation or PDA.
Component	Component refers to asoftware component, a piece of software with documented interfaces that a programmer can use to build an application.
CORBA	Common Object Request Broker Architecture

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Departmental server	A server priced as the minicomputers in INPUT's *Definition of Terms*. Examples are a high-end PC or an SMP UNIX server.
Development Environment	Set of software used by programmers for developing applications that typically consists of compilers, debuggers, visual editors, profilers and performance optimizers.
Development Tools	Short for "application development tools."
Distributed System	A system that runs across multiple computers.
DLL	Dynamic Linked Library, a software component of pre-compiled code that can be linked into an application.
Enterprise Server	A server priced as a mainframe in INPUT's *Definition of Terms*. Examples are an IBM-compatible mainframe or a large SMP server of comparable price. These machines are often clustered.
Firewalls	Hardware and/or software solutions that prevent data from entering or leaving a network. They are most commonly used to protect corporate LANs from the Internet. They protect what may leave a corporate network and also what may enter it.
Framework	A specification or implementation of software that can be used to build an application. It may consist of classes and methods. Motif and the Common Object Request Broker Architecture (CORBA) are examples of frameworks.
Gateway	Software that connects one environment to another. It often translates formats and routes code from one application to another.
GUI	Graphical User Interface—a windowing system like Microsoft Windows or X-Windows with Motif that displays graphical objects.

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HTML	Hypertext markup language—a language for document formats, a dialect of SGML.
Http	High transport transmission protocol—a protocol to move information between a Web server and a client on the internet.
Internet	A publicly available network based on TCP/IP protocols that supports electronic mail, Web sites and other communications solutions.
Intranet	A private network that uses Internet technology; for example, an internal TCP/IP network with browsers and Web servers.
LAN	Local-area network.
MacOS	The operating system for the Apple Macintosh.
Messaging	A general term that describes communication that stores and forwards information. It may also support queues of objects waiting for an event in a network. An example of messaging software is electronic mail or software that supports on-line information services.
Microkernel	An OS architecture in which the system is built around a core set of software known as the microkernel. The microkernel need not necessarily be small. The Mach kernel used by NeXT is an example of a microkernel-based OS, as is Apple's Copland.
Middleware	In this report, middleware is connectivity software that links clients and servers. It is systems software. Further information can be found in INPUT's report, *Middleware: Is DCE the Answer?* Some companies include databases and visual development tools as middleware; these are not included in INPUT's definition of middleware.

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Object Request Broker (ORB)	OMG terminology for the message-based communications interface between objects. An ORB provides the mechanism by which objects transparently make requests of, and receive responses from, other objects; the term has become commonly accepted, but not all products that perform these functions are called ORBs and not all ORBs meet OMG specifications.
On-line services	Services that provide users with information, like America Online, CompuServe, Minitel, NiftyServe, Dialog, and Lexis/Nexis.
OODBMS	Object-oriented database management system.
ORDBMS	Object-relational database management system.
Open systems	In this report, it describes systems that can run on multiple UNIX and/or Windows operating systems, rather than proprietary environments like VMS (even Open VMS) or MVS (even with POSIX compatibility).
OpenDoc	A component software standard managed by Component Integration Labs that was originally set up by Apple, IBM and Novell.
Operating environment	Modern term for an operating system plus its application development tools.
OS	Operating system.
PDA	Personal Digital Assistant—A handheld small computer with personal address lists, organizer information, etc. An example is Apple's Newton.
Platform	This is the software or hardware that an application program runs on.
Port	Verb, as in *to port* or *porting*. Move software from one platform to another; for example if Windows NT is moved to run on Digital's Alpha-based computers, it is ported to run on the Alpha environment.

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POSIX	A standard for operating systems to ensure some level of portability of software code that runs on it. Standards are published by X/Open.
Program	The term is meant to include a wide range of possible constructs, including scripts, loadable modules, etc., in addition to the traditional definition of an application or utility.
Reseller	An individual or company that resells a product. A reseller may or may not change the product to add value. See VAR.
ROM	Read-only memory—used to store information that needs to be readily accessible in a computer. In a PDA it may contain the entire OS.
SGML	Standard generalized markup language—A language defined by IBM and others for document formats, it is used by the government and manufacturing organizations as part of the CALS standards.
Suites	Sets of applications or packages. Office suites typically consist of a word processor, a spreadsheet and a database or electronic mail package.
Three-tier	A C/S architecture consisting of three logical parts of the system: a client, an application logic server and a data/information server. This may be on three computers, or the application logic and data may reside on the same machine, but be logically separate. This model enables data sources and databases to be swapped in and out of the system more easily than in the two-tier model, where the data and application logic may both be stored in the same database.
Two-tier	A C/S architecture in which there is a client and a server. Business logic either resides in the client portion of the application software or in the server.

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URL	Universal Resource Locator—A string that describes an entity on the Internet. For example, "http://www.input.com" describes the URL for INPUT's Web site.
VAR	Value-added reseller—A reseller that adds value to software or hardware by customizing it, adapting it for a specific market segment, integrating it, porting it to a new environment, or adding software to it.
Videoconferencing	Communications between two sites in which each site sees and hears information from the other. The information may be captured from a computer screen or a camera. It may use videoconferencing equipment or a camera on a PC. Communications may be via high-speed phone lines or private networks.
Visual Development Tool	This is the software needed to build an application. It may include a visual editor, a forms designer, a report writer, a compiler, an interpreter, a debugger or a source code control system that enables programmers to share coding tasks.
WAN	Wide-area network.
Web	The World Wide Web.
Windows	Used in this report to refer to Microsoft's Windows if it starts with a capital letter. If it starts with a small letter then it may refer to any software that controls the windows on a computer screen. A window may also be the window seen on a computer screen.
Workgroup	A networked group of computers or people that share information. Typical sizes range from a few individuals to about 100 people.
WWW	World Wide Web

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B

Vendor Names and Addresses

This appendix provides the names and addresses of vendors and organizations mentioned in the report or whose information contributed directly to it.

A. Vendors and Organizations

Exhibit B-1 provides the names and addresses of vendors mentioned in this report.

Exhibit B-1

Names and Addresses of Vendors

Company	Notes
America Online 8619 Westwood Center Vienna, VA 22182 Tel: 703-448-8700 Fax: 703-435-0275 info@aol.com http://www.aol.com	Offers Internet access. Leading on-line service with both business and consumer information. May consider AOL to host its technical support. May also consider information sources on AOL as part of its products or services.
Andersen Consulting 100 South Wacker Drive Chicago, IL 60606 Tel: 312-507-2900 Fax: 312-307-7965	Strong proponent of object technology for systems integration in diverse markets, especially manufacturing. Promoting demand chain management solutions using the Internet, SAP and other leading applications.
Apple Computer 20525 Mariani Avenue Cupertino, CA 95014 Tel: 408-996-1010 Fax: 408-996-0275	Focusing on client workstations for education, publishing, the Internet and multimedia solutions.

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Exhibit B-1 (CONT.)

Company	Notes
AT&T Global Information Solutions (was NCR) 1700 S. Patterson Boulevard Dayton, OH 45479 Tel: 513-445-5000 Fax: 513-445-4184	AT&T GIS is a leader in C/S high-end transaction processing systems, with a strong presence in retail and financial markets. It will spin off from parent AT&T in 1996.
Borland International 100 Borland Way Scotts Valley, CA 95066 Tel: 408-431-1000 Fax: 408-431-4123 http://www.borland.com	Leading provider of application development tools. Announced Latte as a development environment for the Internet. Delphi is a C/S development tool. Also markets Paradox and dBase databases.
Brio Technology, Inc. 650 Castro Street, Suite 500 Mountain View, CA 94041 Phone: 415-961-4110 Fax: 415-961-4572 info@brio.com http://www.brio.com	Strong in the cross-platform and Apple Macintosh markets with application development and business reporting tools. Brio provides a "drag and drop" query tool, created the first desktop multi-dimensional analysis product and today provides tools for user access to databases.
Bunyip Information 310 Ste. Catherine Street West Suite #300 Montreal, Quebec Canada H2X 2A1 Tel: 514-875-8611 Fax: 514-875-8134 frontdesk@bunyip.com http://www.bunyip.com	Has Canadian government application using agents to search the Internet. Developed Archie search technology for the Internet.
Business Objects 20813 Stevens Creek Blvd. Cupertino, CA 95014 Tel: 408-973-9300 Fax: 408-973-1075	C/S reporting and analysis tool. Originally a French company.
California Software, Inc. 2121 E. Pacific Coast Highway, Suite 120A Corona del Mar, CA 92625-1912 Tel: 714-729-4222 Fax: 714-729-4237 http://www.calsoft.com	Acquired by Stac for $10M in October 1995. Intelligent WWW browser, InterAp, using agents.
Compaq Computer Corporation 20555 State Hwy. 249 PO Box 692000 Houston, TX 77269 Tel: 713-374-0484 Fax: 713-374-1740 http://www.compaq.com	Leading vendor of Windows NT server machines, that can be rack-mounted and run in multiprocessor configurations. Also markets systems management software.

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Exhibit B-1 (CONT.)

Company	Notes
CompuServe 5000 Arlington Center Rd. Columbus, OH 43220 Tel: 614-457-8600 Fax: 614-457-0348 http://www.compuserve.com	Leading on-line service provider with high-quality technical support forums that some C/S vendors use to support their products. Also offers an Internet browser and server that supports Microsoft Exchange.
Computer Associates International 1 Computer Associates Plaza Islandia, NY 11788 Tel: 516-342-5224 Fax: 516-342-5329 http://www.cai.com	Leader in systems management tools and services. CA-Unicenter is its flagship C/S product. Some Windows NT software is licensed from ICL. Also licenses OODBMS from Fujitsu.
Compuware Corporation 31440 Northwestern Highway, Fl 2 Farmington, MI 48334 Tel: 810-737-7300 Fax: 810-737-7108 http://www.compuware.com	Leader in midrange C/S systems management services and tools, including EcoTools that supports a messaging backbone for agent-based systems management.
Crystal, a Seagate Company 3873 Airport Way, P.O. Box 9754 Bellingham, WA 98227 Tel: 604-681-2934 Fax: 604-681-7163 http://www.seagate.com/software/crystal	Has agreement with Microsoft for reporting.
Digital Equipment Corporation 110 Spitbrook Road Nashua, NH 03062 Tel: 603-881-1894 Fax: 603-881-2790 http://www.digital.com	Digital bridges the UNIX, Windows NT, PC and proprietary Open VMS architectures with its enterprise platforms. It is strong in connectivity and messaging technologies.
Dynasty Technologies 500 Technology Drive Naperville, IL 60563 Tel: 708-355-8300 Fax: 708-355-9345	Enterprise application development tool vendor.
Forté Software Harrison Street, Floor 15 Oakland, CA 94612 Tel: 510-834-1501	Forté is successfully marketing its cross-platform enterprise development environment that enables applications to be partitioned across different clients and servers.
Four Seasons Software, Inc. 2025 Lincoln Highway Edison, NJ 08817 Tel: 908-248-6667 Fax: 908-248-6675 http://www.4seasons.com	Enterprise cross-platform application development tool based on powerful 4GL and SuperNOVA distributed application development environment.

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Exhibit B-1 (CONT.)

Company	Notes
GE Information Services (GEIS) 410 North Washington Street Rockville, MD 20850 Tel: 301-340-4000 Fax: 301-340-4240 http://www.geis.com	On-line service provider for electronic commerce. Offers a wide range of services, such as news feeds. Also provides private-labeled networks.
General Magic 420 North Mary Avenue Sunnyvale, CA 94086 Tel: 408-774-4000 Fax: 408-774-4010 http://www.genmagic.com	Developer of MagicCap object-oriented operating system and Telescript distributed object language.
Gupta Corporation 1060 Marsh Road Menlo Park, CA 94025 Tel: 415-321-9500 Fax: 415-321-5471 http://www.gupta.com	Focusing on increasing capabilities of its application development tools to make them more scalable to larger environments. Also supports remote and mobile users.
Hewlett-Packard 19310 Pruneridge Avenue Cupertino, CA 95014 Tel: 408-447-4042 Fax: 408-447-5809 http://www.hp.com	HP has a complete line of C/S systems and services, from PCs to workstations to enterprise servers. It is particularly strong in third-party software relationships and systems management. It also is strong in development tools and objects.
Hitachi Computer Products (America) 437 Madison Ave. 21st Floor New York, NY 10022 Tel: 212-751-6302 FAX: 212-751-6368 http://www.hitachi.com	This division of the leading technology supplier, Hitachi, has begun to market its OT capability with a concentration on its application in OLTP.
Hyperion Software (was IMRS) 777 Long Ridge Road Stamford, CT 06902 Fax: 203-322-3904 http://www.hysoft.com	Best-of-breed solutions vendor for C/S financial analysis and accounting software.
IBM Corporation 1 Old Orchard Rd. Armonk, NY 10504 Tel: 914-765-1900 Fax: 914-765-4190 http://www.ibm.com	Leading C/S enterprise systems vendor. IBM was an early leader in object technology implemented into the OS/400 operating software. SOM debuted with OS/2 and has been or is being ported to all IBM operating environments.
ICL Enterprises North America 11490 Commerce Park Drive Reston, VA 22091 Tel: 703-648-3300 Fax: 703-648-3380 http://www.icl.com	ICL is a leading European hardware and systems software supplier and has taken an early position in object-based products.

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Exhibit B-1 (CONT.)

Company	Notes
Illustra Information Technologies 1111 Broadway 20th Floor Oakland, CA 94607 Tel: 510-652-8000 http://www.illustra.com	Successfully transitioned from being a technology vendor of ORDBMS technology to being an Internet solutions supplier with an innovative database for storing multimedia, hyperlinked documents.
Information Builders 1250 Broadway 38th Floor Manhattan, NY 10001 Tel: 212-736-4433 Fax: 212-967-6406 http://www.ibi.com	Leading middleware (EDA/SQL) and 4th generation language (Focus) vendor. Making strong thrust into data warehousing market.
Informix Software 4100 Bohannon Drive Menlo Park, CA 94025 Tel: 415-926-6300 Fax: 415-926-6593 http://www.informix.com	Leading database vendor, strong in parallel servers and UNIX markets. Strong VAR program.
Intel Corporation PO Box 58119 Santa Clara, CA 95052 Tel: 408-765-8080 Fax: 408-765-1821 http://www.intel.com	Leading microprocessor vendor. Also markets PC boards and supercomputers.
Intuit 155 Linfield Drive Menlo Park, CA 94025 Tel: 415-322-0573 Fax: 415-852-0155 http://www.intuit.com	Developing on-line transaction service to pay bills on-line. Targeting personal and small business markets. Example of a small business vendor with a simple solution.
Ki NETWORKS, Inc. 6760 Alexander Bell Drive Columbia, MD 21046 Tel : 410-290-0355 Fax: 410-290-0397 http://www.ki.com	Provides network management solutions for Digital's Netview and HP's OpenView. Working with Sun, IBM, Apple, HP, Digital and others to provide Common Agent technology to bridge both SNMP and Desktop Management Interface environments for network monitoring.
Lockheed Artificial Intelligence Center (Lockheed Martin) c/o LMSC Orgn. 24-01, Bldg. 101 1111 Lockheed Way Sunnyvale, CA 94089-3504 Tel: 408-742-6688 Fax: 408-743-2239 http://hitchhiker.space.lockheed.com/aic/	Undertakes research on agent technology and massive systems.
Lotus Development Corporation 55 Cambridge Parkway Cambridge, MA 02142 Tel: 617-577-8500 Fax: 617-225-1213 http://www.lotus.com	Acquired by IBM for Notes and distributed messaging architecture.

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Exhibit B-1 (CONT.)

Company	Notes
MCI 780 Johnson's Ferry Rd. Atlanta, GA 30342 Tel: 404-250-5500 Fax: 404-250-5591 http://www.mci.com	Providing on-line services for the Internet. Also acquired SHL Systemhouse, leading systems integrator and outsourcing vendor for C/S solutions.
Microsoft Corporation 1 Microsoft Way Redmond, WA 98052 Tel: 206-882-8080 Fax: 206-936-7329	Leader of the desktop environment with Windows and the OLE 2 standard for interconnecting applications. Extending its technology into the enterprise server arena is Microsoft's challenge.
Microware 1900 N.W. 114th Street Des Moines, IA 50325-7077 Phone: 515-224-1929 Fax: 515-224-1352 Internet: info@microware.com http://www.microware.com	Develops OS/9 and David operating environments. Possible candidate for operating environment for Internet appliances.
Netscape 501 E. Middlefield Rd. Mountain View, CA 94043 Tel: 415-254-1900 Fax: 415-528-4124 http://www.netscape.com	Leading supplier of Web browser and server software. May challenge established database vendors with Web servers. Challenges development tool vendors with Internet-compatible solutions.
NeXT Computer Inc. 900 Chesapeake Dr. Redwood City, CA 94063 Tel: 415-366-0900 Fax: 415-780-3714 http://www.next.com	NeXT offers its Portable Distributed Objects (PDO) object model and the Enterprise Objects Frameworks products under the banner of NEXTSTEP, a cross-platform development and run-time system for three-tier applications.
nCube 919 E. Hillsdale Blvd. Suite 200 Foster City, CA 94404 Tel: 415-593-9000 Fax: 415- 508-5408	Specialized hardware for video servers and highly optimized database queries. Parallel machines.
Novell 122 E 1700 South Provo, UT 84606 Tel: 801-429-7000 Fax: 801-377-9353 http://www.novell.com	Novell aims to be a leader in network services such as directories, addressing, transaction management and network administration.
Open Market 245 First Street Cambridge, MA 02139 Tel: 617- 621-9500 Fax: 617- 621-1703 http://www.openmarket.com	Provides secure Web server. Netscape is a competitor. Also provides electronic commerce services.
Oracle Corporation 500 Oracle Parkway Redwood Shores, CA 94065 Tel: 415-506-7000 Fax: 415-506-7151 http://www.oracle.com	Leading database vendor with Developer/2000 development tools and various object-oriented solutions including Power Objects. Oracle will increase its presence in vertical C/S applications. It also aims to reduce the systems integration effort by packaging solutions for branch offices and workgroups.

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Exhibit B-1 (CONT.)

Company	Notes
Palindrome Corporation 600 East Diehl Road Naperville, IL 60563 Tel: 708-505-3300 Fax: 708-505-7917 http://www.palindrome.com	Provides LAN storage management software.
ParcPlace-Digitalk 999 E. Arques Ave. Sunnyvale, CA 94086 Tel: 408-481-9090 Fax: 408-481-9095 http://www.parcplace.com	The August 1995 merger of ParcPlace and Digitalk combines two companies with synergistic OT product capabilities on UNIX and Windows systems, respectively. Visual Smalltalk from Digitalk and Visual Works from ParcPlace are application development tools for Smalltalk environments and C/S programming.
PeopleSoft 1331 N California Blvd Walnut Creek, CA 94596 Tel: 510-946-9460 Fax: 510-946-9461 http://www.peoplesoft.com	Leader in C/S HR software that has led to accounting and manufacturing C/S solutions.
Platinum Technology 1815 S. Meyers Rd Oakbrook Terrace, IL 60181 Tel: 708-620-5000 Fax: 708-691-0707 http://www.platinum.com	Many tools to support databases, including DB2 and other common platforms. Entering the data warehouse and business reporting tools area.
Powersoft 561 Virginia Road Concord, MA 01742 Tel: 617-229-2200 Fax: 617-272-9076 http://www.powersoft.com	A Sybase subsidiary. Developing more scalable versions of its PowerBuilder and PowerMaker application development tools. Also markets Watcom database. Vulnerable to new products from Spider Technologies for the Internet, but agile enough to react positively.
Prodigy Interactive Services Corp. 445 Hamilton Avenue White Plains, NY 10601 Tel: 914-448-8000 Fax: 914-448-8083 http://www.prodigy.com	Prodigy is a leading interactive services corporation. Recently it has increased its marketing efforts to the business community, where it has lost out to CompuServe and America Online.
Red Brick Systems Los Gatos, CA Tel: 408-399-3200 Fax: 408-399-3277 http://www.redbrick.com	Leader in databases for large, sparsely populated databases. Used for analyzing consumer buying preferences in retailing and consumer products companies.
RSA Data Security 100 Marine Parkway Redwood City, CA 94065 Tel: 415-595-8782 Fax: 415-595-1873	Leader in public key cryptography. Technology is incorporated in other products.
The Santa Cruz Operation (SCO) 400 Encinal Street Santa Cruz, CA 95060 Tel: 408-425-7222 Fax: 408-458-4227 http://www.sco.com	Leading independent vendor of UNIX operating system and UNIX software products. Provides affordable platform for branch offices and small organizations.

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Exhibit B-1 (CONT.)

Company	Notes
SAP America, Inc. 300 Stevens Drive Philadelphia, PA 19113 Tel: 610-521-4500 Fax: 610-521-4500 http://www.sap.com	SAP's R/3 is a leading integrated enterprise C/S application, with success in multinational and smaller firms. SAP is particularly strong in the high-technology manufacturing markets and oil and gas.
Silicon Graphics (SGI) 2011 N Shoreline Blvd Mountain View, CA 94043 Tel: 415-960-1980 Fax: 415-961-0595 http://www.sgi.com	Leader in 3D workstations and high-performance servers. Servers are used for WWW and supercomputing as well as databases and 3D support. Entering data mining market.
Spider Technologies 1054 Elwell Court Palo Alto, CA 94003 Tel: 415-969-6665 Fax: 415-969-6883 http://www.3wspider.com	Emerging supplier of development tools for Internet applications.
Sprint International 12490 Sunrise Valley Drive Reston, VA 22096 Tel: 703-689-6000 Fax: 703-689-5176 http://www.sprint.com	Leading telecommunications vendor supplying Internet access and connectivity for virtual LANs.
Spyglass Naperville Corporate Center 1230 Diehl Road, #304 Naperville, IL 60563 Tel: 708-505-1010 Fax: 708-505-4944 http://www.spyglass.com	Internet software vendor. Also provides data analysis tools.
Sterling Software 4600 Lakehurst Court Dublin, OH 43017 Tel: 614-973-7000 Fax: 614-793-7092 http://www.sterling.com	Provides electronic commerce software and services. Also has other divisions providing mainframe software for systems management, storage and applications development.
Sun Microsystems 2550 Garcia Avenue Mountain View, CA 94043-1100 Tel: 415-960-1300 Fax: 415-969-9131 http://www.sun.com	Scalable computing systems from workstations, including notebooks, to servers based on SPARC microprocessor and Solaris OS.
SunSoft 2550 Garcia Avenue Mountain View, CA 94043-1100 Tel: 415-960-3200 Fax: 415-336-0362 http://www.sun.com/sunsoft	SunSoft has a leading position in distributed UNIX computing that it can leverage. NEO is Sun's distributed object environment and tool set that uses NeXT's OpenStep software. SunSoft provides the Solaris operating system for Intel platforms, as well as SPARC, and the Solstice systems management software, as well as application development tools.

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Exhibit B-1 (CONT.)

Company	Notes
Sybase 6475 Christie Avenue Emeryville, CA 94608 Tel: 800-879-2273 Fax: 510-658-9441 http://www.sybase.com	Application development tools, middleware and databases are Sybase's main products. Sybase has several subsidiaries, including Micro Decisionware and Powersoft. The Sybase 11 database is emerging, which should improve scalability and performance.
Symantec Corporation 10201Torre Avenue Cupertino, CA 95014 Tel: 408-253-9600 Fax: 408-253-4092 http://www.symantec.com	Developer of application development tools and compilers, as well as systems management tools, such as Norton Utilities. Also sells ACT sales and marketing software. Entering workgroup C/S market.
Verity 1550 Plymouth Street Mountain View, CA 94043 Tel: 415-960-7600 Fax: 415-960-7698 http://www.verity.com	Provides Web server for full text documents. Provides search and retrieval software.

B. Names and Addresses of Organizations

This section gives leading C/S consortia and standards organizations.

Exhibit B-2

Names and Addresses of Organizations

Company	Notes
Component Integration Laboratories, Inc. P.O. Box 61747 Sunnyvale, CA 94008 Tel 408-864-0300 Fax: 408-864-0380	CI Labs is a nonprofit organization founded by IBM, Apple, Novell, WordPerfect, SunSoft, Taligent and the XSoft division of Xerox to develop and promote the OpenDoc architecture.
The Object Management Group 492 Old Connecticut Path Framingham, MA 01701 Tel: 508 820 4300. http://www.omg.org	The OMG was founded in 1989 by a core group that included Hewlett-Packard, Data General, American Airlines, and 10 other companies specifically interested in promoting object-technology standards. It has a close working relationship with X/Open. It has also managed to attract major user organizations, telecommunications vendors and systems integrators.
Object Database Management Group 13504 Clinton Place Burnsville, MN 55337 Tel 612-953-7250 Fax 612-397-7203 http://www.odmg.org	The ODMG was formed to create one standard interface that all object-oriented database vendors could support. The objective is application portability, as opposed to interoperability.
Open Software Foundation (OSF) 11 Cambridge Center Cambridge, MA 02142 Tel: 617-621-7300 Fax: 617-621-8700 http://www.osf.org	Recently announced Internet products for the World Wide Web. Currently undergoing a management transition.

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C

Forecast Details

This appendix provides other INPUT forecasts here for comparison; as the detailed tables are in the report, they are not repeated here.

A. INPUT Total Software Forecasts

Exhibit C-1 shows INPUT's standard forecasts and growth rates for U.S. systems and applications software. More detailed breakdowns may be found in INPUT's *Forecast Compendium* for the U.S. software and services market.

Exhibit C-1

User Spending on Software—U.S., 1995-2000

Product/Service Sector	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00 (%)
Systems SW Products	23,845	10%	26,212	28,753	31,618	34,876	38,735	43,290	11%
Mainframe	9,475	2%	9,688	9,798	9,810	9,744	9,685	9,584	2%
Minicomputer	7,591	8%	8,235	8,922	9,699	10,578	11,627	12,820	3%
Workstation/PC	6,779	22%	8,289	10,033	12,109	14,554	17,423	20,886	19%
Applications SW Products	28,003	15%	32,111	36,998	42,724	49,451	57,642	67,647	16%
Mainframe	5,907	7%	6,305	6,734	7,171	7,615	8,093	8,631	7%
Minicomputer	6,904	9%	7,517	8,179	8,864	9,583	10,379	11,257	9%
Workstation/PC	15,192	20%	18,289	22,085	26,689	32,253	39,170	47,759	20%
TOTAL Software	51,848	12%	58,323	65,751	74,342	84,327	96,377	110,937	14%

Source: INPUT

Exhibit C-2 shows INPUT's standard worldwide forecast for software. These numbers were extrapolated from the U.S. numbers, because they are not usually broken down by platform in INPUT's worldwide forecast.

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Exhibit C-2

User Spending on Software—Worldwide, 1995-2000

Product/Service Sector	1994 ($M)	Growth 94 95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00 (%)
Systems SW Products	41,786	6%	44,403	47,443	50,921	55,168	60,341	65,168	8%
Mainframe	17,154	1%	17,333	17,533	17,752	18,023	18,364	19,650	2%
Minicomputer	12,875	3%	13,205	13,534	13,864	14,223	14,623	15,062	3%
Workstation/PC	11,757	18%	13,865	16,376	19,304	22,922	27,354	32,551	19%
Applications SW Products	45,628	13%	51,734	59,095	67,935	78,215	90,319	103,867	15%
Mainframe	9,793	5%	10,321	10,954	11,635	12,305	13,180	13,973	7%
Minicomputer	11,391	8%	12,273	13,260	14,319	15,409	16,709	18,045	9%
Workstation/PC	24,444	19%	29,140	34,882	41,981	50,501	60,429	71,848	20%
TOTAL Software	87,414	10%	96,137	106,538	118,856	133,383	150,660	169,035	12%

Source: INPUT

B. C/S Software Forecasts

1. Total C/S Software

Exhibit C-3 shows the C/S worldwide software forecasts. Note that these are high, compared with INPUT's standard forecasts. This is because of differing views on how the world software market will evolve. The thesis of this report is that there are sizable vendors and opportunities overseas and that the U.S.-centric model will erode rapidly over the next five years. This report also includes more Internet products than do INPUT's standard forecasts. There are many new opportunities for software waiting to be exploited in the next five years. The tools are now becoming so easy to use that many who are not programmers will create software. This expansion of the market due to the Internet and the ability to automate tasks that were previously not automated accounts for the bullish nature of the forecasts.

Exhibit C-3

Worldwide C/S Software Forecast by Category and Platform, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
C/S Software	**63,900**	**23%**	**78,900**	**97,100**	**120,100**	**145,800**	**176,300**	**209,900**	**22%**
Systems Software	28,800	18%	33,900	39,800	48,400	57,500	68,600	79,000	18%
Cross-Industry Applications	22,300	26%	28,200	35,000	42,600	50,700	59,300	68,600	19%
Vertical Applications	12,800	31%	16,800	22,300	29,100	37,600	48,400	62,300	30%
C/S Software	**63,930**	**23%**	**78,910**	**97,140**	**120,120**	**145,820**	**176,300**	**209,950**	**22%**
Enterprise Server	12,400	19%	14,740	15,980	17,470	19,090	20,700	21,480	8%
Departmental Server	25,300	25%	31,710	39,500	48,870	59,360	72,290	86,190	22%
Client Workstation/PC	13,440	53%	20,550	25,950	28,750	33,780	37,240	40,550	15%
Cross-Platform	12,790	-7%	11,910	15,710	25,030	33,590	46,070	61,730	39%

Source: INPUT

The systems software market grew faster than expected in earlier INPUT reports. This was in part fueled by the release of new operating system

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versions like Windows 95, the growth of the Internet, which requires support from databases, and the urgency with which corporations have adopted enterprise C/S applications.

Exhibit C-4 shows the U.S. C/S systems software forecast broken down by category and platform.

Exhibit C-4

U.S. C/S Software by Category and Platform, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
C/S Software	**24,978**	**23%**	**30,751**	**37,246**	**44,536**	**52,653**	**61,944**	**72,553**	**19%**
Systems Software	14,928	13%	16,831	19,326	22,846	26,163	29,664	32,643	14%
Cross-Industry Applications	5,700	27%	7,230	9,000	10,880	12,910	15,160	17,660	20%
Vertical Applications	4,350	54%	6,690	8,920	10,810	13,580	17,120	22,250	27%
C/S Software	**24,978**	**23%**	**30,751**	**37,246**	**44,536**	**52,653**	**61,944**	**72,553**	**19%**
Enterprise Server	5,737	15%	6,618	7,003	7,432	7,903	8,665	8,908	6%
Departmental Server	9,528	24%	11,862	14,856	18,357	22,415	27,448	33,459	23%
Client Workstation/PC	5,323	47%	7,823	9,925	10,953	12,995	14,154	15,414	15%
Cross-Platform	4,390	1%	4,448	5,462	7,794	9,340	11,677	14,772	27%

Source: INPUT

2. Systems Software

Exhibit C-5 shows the worldwide C/S systems software forecast broken down by platform and category.

Exhibit C-5

Worldwide C/S Systems Software by Platform and Category, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Systems SW Products	28,820	18%	33,910	39,840	48,410	57,520	68,610	79,040	18%
Enterprise Server	8,890	15%	10,240	10,820	11,730	12,910	14,240	14,930	8%
Departmental Server	7,740	19%	9,210	10,850	13,020	15,210	18,440	20,740	18%
Client Workstation/PC	6,420	10%	7,050	8,760	10,820	14,360	17,860	20,910	24%
Cross-Platform	5,770	28%	7,410	9,410	12,840	15,040	18,070	22,460	25%
Systems SW Products	28,820	18%	33,920	39,830	48,410	57,520	68,620	79,040	18%
Operating Environments	7,270	0%	7,260	7,450	8,470	9,580	10,680	11,890	10%
Operations Management	11,600	18%	13,660	16,010	19,070	23,530	28,780	34,150	20%
Application Development Tools	2,980	21%	3,610	4,660	6,050	6,930	7,910	8,870	20%
Databases and Information Management	4,580	47%	6,730	8,830	11,630	13,950	17,390	19,920	24%
Other	2,390	11%	2,660	2,880	3,190	3,530	3,860	4,210	10%

Source: INPUT

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Exhibit C-6 shows the U.S. C/S systems software forecast broken down by platform and category.

Exhibit C-6

U.S. C/S Systems Software by Platform and Category, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Systems SW Products	14,928	13%	16,831	19,326	22,846	26,163	29,664	32,643	14%
Enterprise Server	4,627	11%	5,158	5,293	5,522	5,803	6,365	6,438	5%
Departmental Server	3,958	14%	4,522	5,346	6,407	7,355	8,298	8,739	14%
Client Workstation/PC	3,093	11%	3,423	4,215	4,973	6,375	7,264	7,994	18%
Cross-Platform	3,250	15%	3,728	4,472	5,944	6,630	7,737	9,472	21%
Systems SW Products	14,928	13%	16,831	19,326	22,846	26,163	29,664	32,643	14%
Operating Environments	3,549	2%	3,619	3,676	4,117	4,547	4,860	5,097	7%
Operations Management	6,812	8%	7,365	8,450	9,914	11,831	13,617	15,482	16%
Application Development Tools	1,347	16%	1,559	1,932	2,323	2,470	2,656	2,844	13%
Databases and Information Management	2,090	46%	3,060	3,984	5,126	5,879	7,036	7,658	20%
Other	1,130	9%	1,228	1,284	1,367	1,436	1,495	1,562	5%

Source: INPUT

3. Cross-Industry Applications

Exhibit C-7 shows the worldwide C/S cross-industry software market broken down by platform and application.

Exhibit C-7

Worldwide C/S Cross-Industry Software, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Cross-Industry Applications	22,310	26%	28,200	35,000	42,600	50,700	59,300	68,600	19%
Enterprise Server	2,231	26%	2,820	3,150	3,408	3,549	3,558	3,430	4%
Departmental Server	11,155	26%	14,100	17,500	21,300	25,350	29,650	34,300	19%
Client Workstation/PC	4,462	90%	8,460	10,500	10,650	11,154	10,674	10,290	4%
Cross-Platform	4,462	-37%	2,820	3,850	7,242	10,647	15,418	20,580	49%
Cross-Industry Applications	22,310	26%	28,200	35,000	42,600	50,700	59,300	68,600	19%
Accounting	10,420	30%	13,500	16,900	20,800	25,000	29,300	33,700	20%
Education & Training	630	27%	800	1,000	1,300	1,600	1,900	2,300	24%
Engineering & Scientific	840	43%	1,200	1,600	2,100	2,500	3,000	3,600	25%
Human Resources	4,590	20%	5,500	6,600	7,900	9,300	10,700	12,100	17%
Office Systems	1,370	17%	1,600	1,800	2,000	2,200	2,400	2,600	10%
Planning & Analysis	1,370	17%	1,600	1,900	2,200	2,500	2,900	3,300	16%
Sales & Marketing	780	15%	900	1,100	1,300	1,600	1,900	2,300	21%
Telephony	400	50%	600	800	1,000	1,200	1,400	1,700	23%
Other Cross-industry	1,910	31%	2,500	3,300	4,000	4,800	5,800	7,000	23%

Source: INPUT

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Exhibit C-8 shows the U.S. C/S cross-industry software forecast broken down by platform and application.

Exhibit C-8

U.S. C/S Cross-Industry Software, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Cross-Industry Applications	5,700	27%	7,230	9,000	10,880	12,910	15,160	17,660	20%
Enterprise Server	570	26%	720	810	870	900	910	880	4%
Departmental Server	2,850	27%	3,620	4,500	5,440	6,460	7,580	8,830	20%
Client Workstation/PC	1,140	90%	2,170	2,700	2,720	2,840	2,730	2,650	4%
Cross-Platform	1,140	-37%	720	990	1,850	2,710	3,940	5,300	49%
Cross-Industry Applications	5,700	27%	7,240	9,000	10,870	12,910	15,150	17,660	20%
Accounting	1,600	27%	2,030	2,540	3,120	3,740	4,380	5,040	20%
Education & Training	200	25%	250	330	410	510	610	730	24%
Engineering & Scientific	400	48%	590	800	1,040	1,250	1,500	1,800	25%
Human Resources	900	22%	1,100	1,320	1,580	1,860	2,140	2,420	17%
Office Systems	500	24%	620	690	760	840	920	1,010	10%
Planning & Analysis	500	32%	660	780	900	1,040	1,200	1,380	16%
Sales & Marketing	400	18%	470	560	670	800	960	1,150	20%
Telephony	200	40%	280	370	460	550	660	790	23%
Other Cross-industry	1,000	24%	1,240	1,610	1,930	2,320	2,780	3,340	22%

Source: INPUT

4. Vertical Applications

Exhibit C-9 shows the worldwide C/S vertical applications software forecast broken down by market segment.

Exhibit C-9

Worldwide Vertical C/S Applications Software, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Vertical Applications	12,800	31%	16,800	22,300	29,110	37,600	48,390	62,310	30%
Enterprise Server	1,280	31%	1,680	2,010	2,330	2,630	2,900	3,120	13%
Departmental Server	6,400	31%	8,400	11,150	14,550	18,800	24,200	31,150	30%
Client Workstation/PC	2,560	97%	5,040	6,690	7,280	8,270	8,710	9,350	13%
Cross-Platform	2,560	-34%	1,680	2,450	4,950	7,900	12,580	18,690	62%
Vertical Applications	12,800	31%	16,800	22,300	29,100	37,600	48,400	62,300	30%
Banking and Finance	1130	10%	1,240	1,350	1,460	1,580	1,710	1,850	8%
Business Services	370	16%	430	490	560	640	740	850	15%
Discrete Manufacturing	1190	60%	1,900	2,950	4,130	5,160	6,190	7,370	31%
Education	500	12%	560	630	710	800	900	1,010	13%
Federal Govemment	1080	16%	1,250	1,380	1,520	1,670	1,840	2,020	10%
Health Services	1470	17%	1,720	2,010	2,350	2,750	3,220	3,770	17%
Insurance	1120	12%	1,250	1,400	1,570	1,760	1,970	2,210	12%
Process Manufacturing	560	50%	840	1,260	1,760	2,380	3,090	4,020	37%
Retail Trade	800	20%	960	1,150	1,380	1,660	1,990	2,390	20%
State & Local Government	300	20%	360	410	450	500	550	610	11%
Telecommunications	1500	60%	2,400	3,840	5,950	8,930	12,950	18,130	50%
Transportation	1210	40%	1,700	2,380	3,090	4,020	5,230	6,800	32%
Utilities	560	50%	840	1,220	1,710	2,310	3,120	4,210	38%
Wholesale Trade	730	23%	900	1,110	1,370	1,690	2,080	2,560	23%
Misc. Industries	270	59%	430	690	1,100	1,760	2,820	4,510	60%

Source: INPUT

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Exhibit C-10 shows the U.S. C/S vertical applications software forecast broken down by market segment.

Exhibit C-10

U.S. Vertical C/S Applications Software, 1995-2000

Software Products	1994 ($M)	Growth 94-95	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00
Vertical Applications	4,350	54%	6,690	8,920	10,810	13,580	17,120	22,250	27%
Enterprise Server	540	37%	740	900	1,040	1,200	1,390	1,590	17%
Departmental Server	2,720	37%	3,720	5,010	6,510	8,600	11,570	15,890	34%
Client Workstation/PC	1,090	105%	2,230	3,010	3,260	3,780	4,160	4,770	16%
Cross-Platform									
Vertical Applications	5,432	37%	7,430	10,020	13,020	17,190	23,130	31,780	34%
Banking and Finance	339	15%	390	450	520	600	690	790	15%
Business Services	111	26%	140	180	230	290	370	470	27%
Discrete Manufacturing	595	60%	950	1,590	1,890	2,250	2,680	3,190	27%
Education	249	12%	280	310	350	390	440	490	12%
Federal Government	650	51%	980	1,080	1,190	1,310	1,440	1,580	10%
Health Services	737	17%	860	1,010	1,180	1,380	1,610	1,880	17%
Insurance	335	13%	380	430	480	540	600	670	12%
Process Manufacturing	280	50%	420	630	950	1,430	2,150	3,230	50%
Retail Trade	240	21%	290	350	420	500	600	720	20%
State & Local Government	180	22%	220	260	310	370	440	530	19%
Telecommunications	600	60%	960	1,540	2,460	3,940	6,300	10,080	60%
Transportation	364	40%	510	710	920	1,200	1,560	2,030	32%
Utilities	225	51%	340	510	770	1,080	1,510	2,110	44%
Wholesale Trade	367	23%	450	550	680	840	1,030	1,270	23%
Misc. Industries	160	63%	260	420	670	1,070	1,710	2,740	60%

Source: INPUT

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C. Forecast Reconciliation

Exhibit C-11 compares the U.S. C/S software market as it was forecast, had it been projected forward to the year 2000, in the 1993-1998 report and this report's forecasts.

Exhibit C-11

Comparison of 1993-1998 and 1995-2000 U.S. C/S Forecasts, $ Billions

	1995 Old Forecast	1995 This Forecast	2000 Old Forecast	2000 This Forecast
Systems Software	9	17	32	32
Cross-Industry Applications	7	7	18	18
Vertical Applications	6	7	21	22

Source: INPUT

As can be seen, the main difference is in the rate at which the systems software market grew in 1994 and 1995. The size projections for the year 2000 are about the same, but the rate of growth of companies like Oracle and Microsoft was higher than INPUT anticipated. Further, new information appliances, the Internet and data warehousing will continue to fuel growth in the systems software market. The biggest discrepancy came from including firewall and security software, which INPUT believes will be a significant opportunity.

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D

User Questionnaire

This appendix provides the user questionnaire for the 110-person survey.

A. User Questionnaire

The cover sheet asked for demographic details. It provided user demographic information on company size, industry, SIC code and number of employees.

1. What organization do you represent?
   Corporate/Departmental IS/User Department

2. Would you please rate the following client software platforms in order of importance to you over the next 5 years for your PCs or workstations. Only rate those that you plan to use on a scale of 1 to 5, where 1=least important, 5=most important. It is assumed when you select a product that you will upgrade to its successors over time.

   __ Apple MacOS
   __ Microsoft Windows NT
   __ NEXTSTEP/OpenStep
   __ UNIX - Digital UNIX
   __ UNIX - HP-UX
   __ UNIX - IBM AIX
   __ UNIX - SCO
   __ UNIX - Silicon Graphics
   __ UNIX - Sun Solaris
   __ UNIX - Other
   __ Other

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3. Would you please rate the following server software platforms in order of importance to you over the next 5 years. Only rate those that you plan to use on a scale of 1 to 5, where 1=least important, 5=most important. It is assumed when you select a product that you will upgrade to its successors over time.

__ Apple MacOS
__ Microsoft Windows NT
__ NEXTSTEP/OpenStep
__ UNIX - Digital UNIX
__ UNIX - HP-UX
__ UNIX - IBM AIX
__ UNIX - SCO
__ UNIX - Silicon Graphics
__ UNIX - Sun Solaris
__ UNIX - Other
__ IBM-Compatible Mainframe
__ Digital OpenVMS
__ Other

4. On a scale of 1 to 5, would you give your reaction to the following advantages of C/S computing: 1=strongly disagree, 5=strongly agree.

Easier user training	No opinion/1 2 3 4 5
Can combine jobs	No opinion/1 2 3 4 5
Can run off-the-shelf software package	No opinion/1 2 3 4 5
Lower maintenance costs	No opinion/1 2 3 4 5
Can reprogram system easily	No opinion/1 2 3 4 5
Many users can access the same info	No opinion/1 2 3 4 5
Users can communicate faster	No opinion/1 2 3 4 5
Better communications with suppliers	No opinion/1 2 3 4 5
Better communications with customers	No opinion/1 2 3 4 5
Other	No opinion/1 2 3 4 5

5. On a scale of 1 to 5, would you give your reaction to the following disadvantages of C/S computing: 1=strongly disagree, 5=strongly agree.

Slow response times for users	No opinion/1 2 3 4 5
Unreliable network	No opinion/1 2 3 4 5
Hard to integrate with existing systems	No opinion/1 2 3 4 5
Expensive to support upgrades on PCs	No opinion/1 2 3 4 5
Security weaknesses	No opinion/1 2 3 4 5
Costs are higher than expected	No opinion/1 2 3 4 5
Communication between IS and users poor	No opinion/1 2 3 4 5
Standards are not mature enough	No opinion/1 2 3 4 5
Cannot get senior management to invest sufficiently in new systems	No opinion/1 2 3 4 5
Other	No opinion/1 2 3 4 5

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6. How big is your budget for software and services, including IT consulting, IT training, progrmaming services and systems integration?
   Please exclude hardware figures or indicate where it is included.
   Don't know/Has no budget/ 0-100K, 101-250K, 251K-1M/1M-5M/5M-25M/25M-50M/>50M

7. How big is your budget for software and services for all C/S applications?
   C/S applications are those that run on both a client (e.g. PC) and a server.
   Please exclude hardware figures or indicate where it is included.
   Don't know/Has no budget/ 0-100K, 101-250K, 251K-1M/1M-5M/5M-25M/25M-50M/>50M

8. What percentage of your budget is spent on
   Maintenance and upgrades _
   Packaged applications software _
   Packaged systems software _
   Contract programmers, systems integrators or professional services _
   Other _

9. Approximately how much does your organization expect to spend on the following in 1996 for software and services? What will be your three most important expenditures? Will any of these be for C/S systems?

10. For the previous question, were the budgets for
    the entire company/all U.S. systems/all systems at your site/all systems in your department?

11. On average, how much will your budget for C/S software and systems increase from 1995 to 1996?
    Not increased/0%/0-10%/10-20%/20-30%/30-50%/50-100%/Other
    Comments?

12. Which applications are you likely to run with text-based user interfaces on terminals or PCs used as terminals for the next three years?

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